TRANSACTIONS

OF THE

Seventh International Congress of Hygiene and Demography.

LONDON, AUGUST, 10TH–17TH, 1891.

Patron:—HER MAJESTY THE QUEEN.

President:—H.R.H. THE PRINCE OF WALES.

VOLUME I.

THE OPENING MEETING OF THE CONGRESS;

AND

THE PROCEEDINGS OF

SECTION I.

PREVENTIVE MEDICINE.

EDITED BY C. E. SHELLY, M.A., M.D.,

Assisted by the HONORARY SECRETARIES of the SECTION.

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PRINTERS TO THE QUEEN'S MOST EXCELLENT MAJESTY.

1892.

The Transactions of the Seventh International Congress of Hygiene and Demography are comprised in 13 Volumes, of which the first nine contain the Proceedings of the several Sections of Division I.—Hygiene; Volume I. including also an account of the Opening Meeting of the Congress. The tenth Volume contains the Proceedings of Division II.,—Demography; the eleventh, those of the special Indian Committee, together with reprints of several papers bearing upon the subject of Indian Sanitation which were originally contributed to various other Sections. The twelfth Volume (Municipal Hygiene and Demography) comprises reports on their sanitation, vital statistics, and local history, furnished to the Congress by some 35 municipal bodies in various parts of the United Kingdom, India, and the Colonies. And Volume XIII., contains—besides Reports on the History and Organisation of the Congress, and accounts of the Closing Meeting of the Congress and of the special meeting on the Education and Registration of Plumbers—Lists of Delegates to the Congress, of the various Committees, of Members, and of Subscribers: an Index of Contributors to the Transactions: and reprints of the Tables of Contents and of the Indexes to the several Volumes. This, the last Volume of the series, serves, therefore, as a key to the whole of the Transactions. Each separate Volume is provided with its own Table of Contents, and also with an Index,—except Volume XII., for which, as the several papers are printed in the alphabetical order of the towns or districts with which they deal, an index is not required. But, as all these Tables and Indexes recur in their proper order in Volume XIII., the precise position of a paper contained in any of the twelve preceding Volumes may easily be ascertained by consulting this Volume only. Moreover, reference to an author's name in the Index of Contributors to the Transactions will at once show the Volume and the page in which his paper or speech is to be found.

The diagram on page 38 of Volume V. was kindly furnished by the Editor of *Industries:* the Council of the Scottish Meteorological Society permitted the use of the plates from which were prepared the electrotypes which illustrate Dr. Alexander Buchan's paper in the same Volume; and for the diagrams illustrating Mr. Ernest Turner's paper on the Sanitation of Theatres, in Volume VI., the Congress is indebted to the courtesy of the Editor of *The Builder*.

It would have been an achievement of ideal satisfaction if the appearance of the Transactions of the Congress could have followed immediately on the termination of its labours. In explanation of the impossibility of attaining such a result it may be pointed out that if the Congress had been less successful—if its numbers had been smaller, the field which its operations covered less extensive, the interest which it excited less wide-spread, the papers contributed to it less numerous and

less valuable, and the discussions to which they gave rise less thorough, then the collection and publication of its proceedings would have been proportionately simplified. More than two-thirds of its 2,882 members sent in their names on the Saturday which preceded, and on the Monday which marked, the opening day of the Congress; and, until its financial position had been ascertained, the Committee would not have been justified in giving *carte blanche* for dealing with the numerous manuscripts received. Indeed, it was not until close upon the end of the year 1891, that the Finance Committee felt able to sanction the printing of the proceedings, practically *in extenso.* The time necessarily required for the collection and revision of manuscripts and proofs communicated by authors residing in all parts of the civilized world, and for the preparation and execution of illustrations — to say nothing of the paralyzing effect of the epidemic outbreak which marked the earlier months of the present year, and of a serious fire at the printers which greatly interrupted the progress of their work — accounts for subsequent delay in the appearance of these volumes. At the same time it may be averred that no pains have been spared by those directly concerned in their compilation in their endeavours to make the Transactions a faithful record of the proceedings of the First International Congress of Hygiene and Demography which has been held in England.

I am grateful for this opportunity of acknowledging my indebtedness to the several members of the Executive—and particularly to Sir Douglas Galton, the Chairman of the Organising Committee, to Dr. Corfield, the Honorary Foreign Secretary, to Dr. Poore, the Honorary Secretary-General, and to the Honorary Secretaries of the various Sections—for help which in measure and in value is comparable only to the ready kindness and unvarying courtesy with which it has been always given.

CHARLES EDWARD SHELLY.

Hertford,
December, 1892.

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OPENING MEETING

OF THE

SEVENTH INTERNATIONAL CONGRESS OF HYGIENE AND DEMOGRAPHY.

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10TH AUGUST, 1891.

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London, August 10th–17th, 1891.

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THE OPENING MEETING.

The opening meeting of the Congress was held on Monday, 10th August, in St. James' Hall. The President, His Royal Highness the Prince of Wales took the chair at 3 p.m. precisely. The hall was crowded in every part by members of the Congress. As the Prince, attended by the executive officers of the Congress, entered the hall, the organ played the National Anthem, and the audience, which included many ladies, rose, and gave His Royal Highness a most cordial welcome.

A gold badge having been handed to the Prince as President of the Congress, His Royal Highness opened the proceedings by calling on Dr. Poore, the Secretary-General, who announced letters, expressing regret at the inability of the writers to attend, from his Royal Highness the Duke of Edinburgh, his Royal Highness the Duke of Connaught, his Royal Highness the Duke of Clarence and Avondale, his Royal Highness the Duke of Cambridge, his Serene Highness Prince Christian, the Duke of Westminster, and several other distinguished personages.

Sir Douglas Galton, who was called upon by the Prince, said he, as the mouthpiece of the International Permanent Committee of the Congress appointed at Vienna, had the honour to present to his Royal Highness the report of that committee. The report was as follows:—

"The Permanent International Committees of Hygiene and Demography, appointed at the Congress held in Vienna in 1887, beg to report that the English members intrusted with the organization of the present Congress—viz., Sir Douglas Galton, Professor Corfield, and Mr. Shirley Murphy, together with other English members of the Vienna Congress —viz., Sir Spencer Wells, Professor (now Sir George) Humphry,

Dr. Charles Cameron, M.P., Professor Frankland, and Dr. Mapother—issued a letter inviting co-operation in the formation of a general committee. This committee at its first meeting elected an organizing committee, of which Sir Douglas Galton was elected chairman, and Professor Corfield and Mr. Shirley Murphy honorary secretaries. A public meeting was held at the Mansion House, by the kind permission of the late Lord Mayor of London, to make the Congress more widely known, and was largely and influentially attended. A meeting of the permanent committee was held in Paris at the time of the International Exhibition in 1889, at which there were present Dr. Brouardel (chairman), Sir Douglas Galton, Professor Corfield, and Mr. Shirley Murphy, as members; and also Dr. Napias, Dr. A. J. Martin, and Dr. Mapother. Subsequently to this His Royal Highness the Prince of Wales graciously accepted the post of President to the Congress, and presided at a meeting of the general committee held in London, at which Professor Corfield was elected honorary foreign secretary, and Dr. G. V. Poore, honorary general secretary of the Congress, Mr. Shirley Murphy having resigned his position as secretary of the organising committee on account of the pressing nature of his duties as medical officer of health of the London County Council. It having been left to the English committee to select representatives for Egypt and Japan on the permanent committee, they have elected Dr. H. R. Greene Pasha to represent Egypt and Dr. Shimpei-Gotoh to represent Japan. A number of additional members have also been elected to the committee for the purposes of the present Congress. The work of the Congress has been arranged in two divisions, viz., hygiene and demography, and it has been found necessary to divide the former into nine sections, each under a separate president, and with separate organisation. Committees have been organised in foreign countries to further the interests of the Congress in a more direct manner than could be done from England. Delegates have been appointed by all the Governments of Europe, and also by the United States, Mexico, Venezuela, Japan, Persia, Egypt, by the provinces and Native States of the Empire of India, by the most important colonies, and also by numerous municipal authorities, Universities, scientific, and medical societies, and other institutions throughout the world, and large numbers of the most important authorities on the subjects to be treated of have sent communications to be laid before the Congress. The permanent committee have, therefore, every reason to believe that, under the presidency of your Royal Highness, the Congress will be in every way worthy of the occasion, and will contribute largely to the promotion of sanitary science in all parts of the world."

Sir Douglas, proceeding, said that Congress, which had the advantage of being presided over by His Royal Highness, had, in consequence of that fact, received a degree of support from the whole British Empire which was unparalleled. (Cheers.) The Congress at present numbered more than any previous Congress. They had delegates from almost every country—certainly from every important country—in the world. They had also delegates from many British colonies, but he especially desired to emphasise that they had received a very large

support from the British Indian Empire. (Cheers.) They had received large subscriptions from various native Princes, and they had about 70 delegates coming from India, many of whom were non-official delegates, and he believed that it was the first time in the history of the Congress —even in the history of any Congress—that India had contributed so largely to a meeting of this nature held in Europe. (Hear, hear.) He would not trouble his Royal Highness with any further remarks, but he would point out that the organising committee had endeavoured to do all in their power to make the Congress a success, and that if there were any shortcomings they would endeavour to remedy them before the end of the meeting. (Cheers.)

His Royal Highness the Prince of Wales, on rising to deliver the presidential opening address, was received with loud and prolonged cheering. He said:—Sir Douglas Galton and Gentlemen,—It gives me great pleasure to open the proceedings of this Congress, and to offer a hearty greeting to all its members, especially to those whom it has induced to come from distant countries. Many as have been the meetings for good purposes over which it has been my good fortune to preside, there has very rarely, if ever, been one of which the object has been approved by a greater weight of authority. The importance of our Congress is proved, not only by the large number of members who have assembled here to-day, but by the names of those who are on the list of its officers, both honorary and active. Under the Queen's patronage this list includes, together with several members of my family, some of the principal members of Her Majesty's Government, the presidents of nearly all the medical corporations, representatives of the Universities and of the chief medical and scientific societies in the United Kingdom, delegates from nearly every great country in the world, and from all our sanitary institutions and medical schools, many official representatives of our colonies and India, the Lord Mayor and Sheriffs of the City of London, the masters of several of the City companies, and a great majority of those who, here or elsewhere, have gained the highest renown in the study of public health or of the sciences most nearly allied to it. All these approve of the design of the Congress, and they may well do so, for in so far as its object can be fulfilled it will everywhere bring good to all classes of society. (Cheers.) As one looks through our programme, it is impossible not to feel distress and even horror at the multitude of dangers to health in the midst of which we have to live. Some of them appear at present to be inevitable, but the great majority may certainly with due care be averted. I cannot pretend to be able to judge but of a few of these dangers, but I would take as examples those to which my attention was especially drawn when I was a member of the Royal Commission on the Dwellings of the Working Classes. (Cheers.) I learned much there of the dangers to health which may be ascribed to the constant increase of our great manufactories and to other industries from which especially come the overcrowding of our towns, the building of huge factories, the pollutions of our atmosphere, the accumulations of refuse, the fouling of rivers, the impurities of earth,

and air, and water. (Cheers.) I learned not only these dangers, but the immense difficulty of increasing or even maintaining our activity in all branches of trade without incurring heavy risks to health, more particularly in our chief centres of population. The task of averting them might have appeared hopeless, but I have rejoiced to see how much has already been done in diminishing them, and to observe how our registers bear witness to the decreasing mortality in our large towns (hear, hear), to the increasing average length of life in the whole population (hear, hear), and to many facts proving the good influence of our sanitary institutions. But on them I do not now propose to dwell; I will only conclude from them that the good already done, and the constantly increasing knowledge of the whole subject, may make us sure that much more good may still be attained, and that neither this nor any other nation should be content until prosperity in business and all other things desirable for the national welfare are made consistent with national good health. (Cheers.) How the many dangers which our programme indicates may best be dealt with will, of course, be discussed in the several Sections. It will be no trivial work if their sources and probable remedies can be clearly pointed out, and, especially if this can be done, as in a Congress such as this it should be, in a strictly scientific manner, calmly and dispassionately, without any reference to either general or municipal politics, or for any other purpose than the promotion of health. (Cheers.) It is only on conviction such as may thus be produced that the appointed sanitary authorities can compel the changes necessary to be made, for such changes are almost always inconvenient or injurious to some, and might even seem unjust to them, unless it be made quite clear that they would be very beneficial to the community. (Hear, hear.) But my hope is that the work of this Congress may not be limited to the influence which it may exercise on sanitary authorities. It will have a still better influence if it will teach all people, in all classes of society, how much every one may do for the improvement of the sanitary conditions among which he has to live. I say distinctly "all classes," for although the heaviest penalties of insanitary arrangements fall on the poor, who are themselves least able to prevent or bear them, yet no class is free from their dangers or sufficiently careful to avert them. (Hear, hear.) Where could one find a family which has not, in some of its members, suffered from typhoid fever, or diphtheria, or others of those illnesses which are especially called "preventible diseases"? Where is there a family in which it might not be asked "if preventible, why not prevented"? (Cheers.) I would add that the questions before the Congress, in which all should take personal interest, do not relate only to the prevention of death or of serious diseases, but to the maintenance of the conditions in which the greatest working power may be sustained. In this I include both mental and bodily power; for the highest possible prosperity must be when men and women of all classes, rich and poor alike, can safely do such good and useful work as they are fit for, and for which they are responsible to those among whom they live. To this end it is essential that they should enjoy the best possible health and vigour; and to obtain

these it is necessary that everything possible should be done for the promotion and maintenance of the national health. Such, then, is to be your work; let me say our work, for though I cannot further contribute to the proceedings of the Congress, I shall watch them with much interest, and shall always strive to promote whatever may be here plainly shown to be useful for the public health. (Loud cheers.)

Replies to this address of welcome were then delivered by several foreign delegates. The first was in French by Dr. Brouardel, Dean of Faculty of Medicine of Paris. He said :—

In the name of the French members of the Congress of Hygiene and Demography I offer our respectful homage to His Royal Highness the Prince of Wales. We pray that he will convey to Her Majesty the Queen of England the expression of our most heartfelt thanks. Her Majesty has graciously deigned to accord to this Congress her Royal patronage, and we hope that the work achieved by it will justify this mark of her gracious approbation. We are aware that in England public opinion is ready to second our efforts; we have a sure guarantee of this in the history of the last half-century. In the year 1837, the year of the coronation of Her Gracious Majesty, appeared the Act which rendered obligatory the registration of deaths. This Act inaugurated the era of administrative reforms concerning the public health which our valued colleague of the Local Government Board has rightly called "the Victorian era." This Act did not long remain alone. Under the impulse given by two of your most illustrious patriots, William Farr and Edwin Chadwick, you have organised a system of registration of the causes of diseases and of deaths. Certain important cities, before the law made it obligatory, obtained supplies of water beyond all suspicion of pollution, and adopted systems of removal of foul water and waste matters. In these cities, whose action cannot be too much praised, the sickness and death rates diminished rapidly; this furnished the necessary proof—it was time for reform. Twenty years ago the Local Government Board was established, and in 1875 had submitted to Parliament a Bill for the protection of the public health. During its discussion in Parliament one of your greatest Ministers (Disraeli) pronounced in the House of Commons these memorable words, which should be repeated in all countries and in all Parliaments :—"The public health "is the foundation on which repose the happiness of the people and the "power of a country. The care of the public health is the first duty of a "statesman." Since this, each year you have made fresh improvements in your sanitary laws; if in your eyes they are not perfect, in the eyes of the nations who surround you they are an ideal towards which all their most ardent aspirations tend. It is your example they invoke when they claim from the public authorities the powers necessary to oppose epidemics, to combat the scourges which decimate their populations. You have taken the first rank in the art of formulating laws for the protection of health; this is not all that you have done in the domain of hygiene. Among the diseases which one can properly term pestilential, there are, thanks to the work of the hygienists of all countries, certain ones which from the present time may be considered as preventible—

such are small-pox, typhoid fever, dysentery, and cholera. For one of these, the most terrible, the immunity conferred by vaccination is absolute. The person upon whom this immunity is conferred can pass through the most severe epidemics and expose himself to all sources of contagion without being affected. Who is it who thus preserves from death, from blindness, from infirmity millions of human beings of all countries and of all races? On the 18th May 1796, a date which might well be the date of a great battle, Jenner inoculated with vaccine matter by means of two superficial incisions the youth James Phipps. Protection against small-pox belongs to you; the world will be to you for ever obliged. Let us consider two other epidemic diseases. Is it possible to establish the conditions of propagation of typhoid fever without quoting the names of Budd and of Murchison? I am aware that in 1855 Dr. Michel de Chaumont had for the town in which he lived experimentally established the rôle played by drinking water in the propagation of this disease; unhappily public opinion was not prepared, and his discovery was not listened to. In the work which we are considering the efforts of the English school were most fruitful. May I recall the fact that it was the epidemic of cholera in 1866 in England which gave birth to the theory of its propagation by drinking water? Was it not at that date that, under the influence of your hygienest Sir John Simon, the Lords of the Privy Council issued an order formulating the laws of prevention which we adopt to-day? Certain it is that even in England these discoveries have not immediately borne all their fruit. The anti-vaccination leagues are not yet dead. Proofs accumulated during a century have not sufficed to open all eyes; it is not only physically that persons are born blind. After the enthusiasm which each discovery receives come the difficulties of application, doubts, reactions. In the country of the great Harvey it is not necessary to recall the laws which govern the human mind. Has the glory of him who discovered the circulation of the blood been lessened by the rudeness of strife? Be assured that that of the English hygienists will survive present difficulties. It will survive, because the benefit derived from these discoveries is international, and is not limited to a single people. We all of us praise the success of our neighbours; we know that our compatriots will find it an advantage to their comfort, their health, and their lives. In this career there are rivals, but not enemies. But if the benefit is to all, the glory is to one alone, and that country has the right to be proud of the moral authority which the genius of one of her children gives her. For the last 15 years medical doctrines, especially those most concerned with hygiene, have undergone a revolution which surpasses in importance all those of which history has taken notice. Can France be represented in a Congress of Hygiene without recalling the name of M. Pasteur? For centuries we have asserted that epidemic diseases were propogated by means of contact, by the air, by effluvia, by miasmata. The idea of morbific germs, if not the name, is even found in the works of Hippocrates, but in what an uncertain sense! The theory of contagion has passed from century to century with strange modifications; the uncertainty of the methods of research and the difficulties of observation

bound up together truth and error. It remained for Pasteur to prove the existence of these germs, their form, their life, their mode of action, and, by their attenuation to solve the problem of immunity. Thanks to his works, and thanks to those of his pupils, realities have succeded to contingent possibilities. We know some of our enemies, their habits, and their mode of penetrating the body; up to this time man was conquered by these infinitesimal beings, but thanks to recent discoveries he will be their conqueror. When at the beginning of a century one can inscribe the name of Jenner, and at its end that of Pasteur, the human race may rejoice; more has been done for it against misery, disease, and death than in any one of the centuries which have preceded it. You, gentlemen, have been the initiators; this title will never be disputed with you. When a great people has given such an example; when by her gracious patronage her Majesty the Queen, and when, by his presence, his Royal Highness the Prince of Wales testify that for them this era of reforms is not closed, it is only right that those who try to imitate them and to give their country similar institutions should come to bring to that people and to their Sovereign the homage of their profound respect. Gentlemen, I will finish by addressing to the City of London our sincere thanks for the gracious reception which she has given to her guests. Thanks to you, we shall bring together here an association of ideas and of men. This task will be made easy for us by the preparations of the organising committee. If the success of the Congress answers, as I have no doubt that it will, to our expectations, it is to the organising committee that we must assign the honour. We beg Dr. Corfield, who has undertaken the severe task of conducting the foreign secretarial work of the Congress, to accept our personal thanks. Gentlemen, France hopes that the London Congress will occupy a place of honour in the lists of the congresses of hygiene. (Cheers.)

Dr. von Coler, Director-General of the Prussian Army, said:—Charged by the German Government, especially by that of Prussia, and in the name of all those from the German Empire who with me responded to your call to the Congress, I have to offer you the warmest thanks for your kind invitation, and I need hardly add how highly I appreciate the great honour thus conferred upon me. The great number of delegates alone who have been sent from my native country to attend this Congress clearly proves the lively interest felt at home in all the future labours and deliberations of this distinguished assembly. It is, indeed, with a feeling of joyous pride if from this place and in this country, where we have to trace the very cradle of all the modern science of public health, I am permitted to point out how the many efforts made in the direction of hygiene radiating from England were, especially in Germany, hailed with much delight, where they received the most careful attention, and where they ever since have been most actively promoted. And for all that has been done there existed good reason. Mankind has ever to struggle against, ever to resist the forces of Nature, the subjection of which is the goal of our efforts. The highest degree of culture is alone to be found where man has most perfectly subdued Nature to his will. In that formidable struggle it is hygiene

which forges the most efficient weapons. Of eminent usefulness, refreshing and invigorating, is the spring that flows from every science; but so full of blessings, so advantageous to the common welfare and to individual happiness, scarcely another science exists equal to hygiene. Germany has herself gone through that experience. Yes. Could I lead you from our most magnificent palaces to the humblest homesteads of the toiler—show to you the arrangements of our metropolis and those of a lonely workman's shop—all and everywhere the observing eye would meet with valuable hygienic efforts and improvements, all serving to benefit the single individual as well as the community. The dearest to the heart of the German nation is its army, formed by the sons from all ranks of the people. And it is this grand institution which, independent of a rarely-occurring war, in times of peace and for the furtherance of peaceful purposes, has become its national school of physical and intellectual development, a source of the highest virtues of mind and body, a source of our sublimest ideals. It is in this fine national institution, where the blessings of hygienic science have abundantly been received, that the greatest success may daily be distinctly observed. We must thank, above all, hygiene and her teachings, if it has been possible to considerably lessen, from year to year, the number of patients in the army, and to reduce the number of deaths to a minimum. In the year 1888–89 alone 79,500 men applied for surgical or medical treatment below the average of the 10 preceding years. Consequently many hundred thousand days of sickness which formerly had to be devoted to medical treatment have now been won for better physical and intellectual education of the men. The death-rate has diminished by two-thirds in the same time (from 6·9 per cent. in 1868 to 2·3 per cent. of the present force in 1888–89), and during the last year we counted at least 1,500 deaths less than in 1868. Comparing these figures with the numerical strength of the army of the present day and of that year, what an amount of national fortune and human happiness we trace in summing up these events! Every single man, when he attains the age to serve in the army, represents a pretty fair-sized capital, to secure which in the national interest has been the successful task of hygiene; and incalculable are the beneficial consequences which lie in the fact that in every year ten thousand of our men more remain now healthy and free from the germs of disease—men who, after completing their military services, return home, peacefully settle down, and offer in their robust state of health the best guarantees of becoming fathers of a healthy rising family. Truly considered in this light, the costs for hygienic arrangements are, through the fruits they bear, more than a hundredfold repaid. If from our army diseases like malaria, small-pox, dysentery, have completely, or almost completely, disappeared, if typhus fever and diphtheria become more and more diseases of the past, we have to be thankful for these attainments to the development and application of hygiene. Under the reign of His Majesty the Emperor and King William II., who, with a truly royal heart and strong determination, secured for hygiene in our country its rightly deserved place, the most magnificent results have crowned this

work, results which until recently were thought to be almost impossible of attainment. Proved by experience, it is now an established fact that infectious diseases are by no means a necessary evil in the army. They are simply diseases which can be avoided, which can be powerfully opposed, and against which the science of our day battles victoriously with ever-increasing success. We all fervently hope that the councils and resolutions of the Congress may lead to the advancement of science, to the happiness of men, and to the glory of this great and hospitable country. (Cheers.)

Professor Corradi, of Pavia, delivered an address in Italian, of which the following is a translation :—Your Royal Highness, ladies and gentlemen,—I bring you the homage and the salutations of Italy. Ancient are the chains which bind my country with England, and science has made them more lasting. Lanfranc, of Pavia, and Anselm, of Aosta, restored, in the eleventh century, learning to Canterbury, and from among the students of our universities the English nation took them. But already Robert of Anglia was among the rectors who opened, in the year 1205, our university at Vicenza, having removed from Bologna, where, a little before, the poet Gualfrido had taught literature with great success, and where, a little afterwards, Alano, the universal doctor, rendered famous the chair of canonical law. The teachings and the discipline of the Italian schools entered with scholars become teachers into Oxford and Cambridge, and the traditions were maintained. But, if these had become chains of habit, a more intimate connexion followed in the sixteenth century. William Harvey reunited indissolubly in the field of science the names of the two nations, by giving the demonstrations of a fact of which the fundamental principles were discovered in the Anatomical School of Pavia; but, instead of partial portions and scattered or uncertain ideas, he evolved a complete system under which all is known in the greatest simplicity. The discovery of the circulation of the blood is the most solemn testimony that one begins great things and another finishes them. This remarkable event signalised one of the greatest moments in the history of science, not only by the fact itself, but by the new spirit which it introduces into biology, in which is the foundation of hygiene. Moreover, to recall here the names of the doctor of Folkestone, and of the hospital of St. Bartholomew, the *stator perpetuus* of the Royal College of Physicians of London, is to forbode well of the seventh International Congress of Hygiene; the glory of Harvey is reflected upon his predecessors, his masters; to salute him is to salute both Italy and England, who affectionately join in celebrating his immortal name. (Cheers.)

Mr. Joseph Körösi, Director of Municipal Statistics of Budapest, said :—As a representative of statistical demography in Austria-Hungary, I beg to be allowed to express in a few words our sense of deep gratitude for the honour which has been bestowed upon us by the patronage of Her Majesty the Queen, and by the presidency of His Royal Highness the Prince of Wales. It is not for the first time that the representatives of statistical science have been called upon to meet under the patronage of your great Queen, and to work under the protection of her illustrious

Throne. Thirty years have passed since the International Statistical Congress met in this hospitable town to do its fruitful work. Your place, your Royal Highness, was taken then by your illustrious father, who spoke to us those ever-memorable words of wisdom and benevolence, which have shone upon the path of statistical science ever since, and which are still gratefully remembered by us. While deeply moved by gratitude towards our Royal president for the interest taken by him in our work, we cherish in our hearts as well the memory of the illustrious deceased. But it is not to single persons only that our gratitude is due: we have to thank all England, the genius of the great English nation, for it is England whom, among all nations of the world, we must consider the mother country of statistics, especially of demography. This branch of science, the very nucleus of statistical work, which, in fact, is quite a science in its own right, has chosen the task of investigating the laws which regulate the life, increase and decrease of nations. Its work therefore, comprises three main parts—statistics of natality, of mortality (this part including biometry), the science of measuring the duration of human life, and of the increase of population. And when inquiring now who were the founders of this new science, we shall hear unanimously quoted the names of England's sons — Graunt, Petty, Halley, Malthus. Gentlemen, to-morrow, when we are about to begin our work, we shall meet within the venerable hall of the Royal Society. It was in the old room of this society, then in its very first youth, but soon rendered conspicuous to the world by the genius of Newton, that Graunt, 230 years ago, established for the first time the problems of demography, and that the King himself, admirably appreciating the work done, recommended that the author should be received as a member of the learned society. The Congress of Hygiene and Demography will continue his work on the very birthplace of demography. It was there that, shortly afterwards, Sir William Petty, by the eminent power of his genius, raised the new science to political importance and to popularity and it was again there that in 1693 the famous Halley became the founder of biometry, the most important part of demography, by working out the first "table of mortality." And now the young science, which two centuries ago left those halls, shy, and even without a name, passing through the world under the pseudonym of "political arithmetic," has found its way over the whole globe. Having been worked out in Germany, having received a name and new ideas in France, and having been enlarged and imbued with a more scientific character in Belgium by Quetelet, having got its well-equipped offices in every country of the civilised world, we are proud to see its numerous representatives meet at the same place, where, two centuries ago, the science was born. Yes, after a triumphant career of 230 years it returns to its home, in which it awoke to light, and again the Throne of England receives it with favour and benevolent interest. For demographic, not less than for all statistical work, it is of the highest importance that its representatives, scattered as they are over the whole globe, should fully understand each other; for only so can we accomplish what we aim at, that our observations may comprise equally all countries of the world, that our

researches may be conducted and worked out on the same principles everywhere, and that we may combine the incomplete and often discrepant observations of single nations in a full descriptive history of all civilised mankind. This was the highest aim of the past statistical congresses; this was the chief inheritances of the subsequent demographical congresses and of the International Institute of Statistics, and it must be recognised that both scientific bodies have done a great deal for the unification of demographical statistics, and especially for that of census results. This great aim fully deserves the praise which the illustrious Prince Consort bestowed upon it 30 years ago. He said :—

" The importance of congresses cannot be over-rated; they not only awaken public attention to the value of these pursuits, and bring together men of all countries who devote their lives to them, and who are thus enabled to exchange their thoughts and varied experiences, but they pave the way to an agreement among different governments and nations to follow up these common inquiries in a common spirit by a common method and for a common end."

May we, the statisticians of a second generation, add a little during this congress to the great international work before us, and may to our successors the memory of this congress and the name of its Royal president be as dear to us as the memory of the former congress and its illustrious president. (Cheers.)

Dr. W. Roth, Surgeon-General of the army of Saxony, said :—Your Royal Highness, My lords, ladies, and gentlemen,—It is with the greatest pleasure that I comply with the request to address this meeting on behalf of the German Committee for the International Congress of Hygiene. A hygienic congress in England is an event strikingly in accordance with the character of English life. It is unquestionable that, in the whole field of hygiene, England has been foremost in practical work, thanks to the great number of eminent men who have devoted their powers to the subject. But while fully acknowledging the prevalent importance of their work, it must be confessed that it is the wealth of this great country which enabled them to create their sanitary institutions we have before us, and the gigantic scale of which is a surprise to us. It is quite a peculiarity of England to conduct experimental researches on a grand scale, and we may say truly that England saves us the trouble of experimental investigation. And while we in Germany fully acknowledge the splendid sanitary work done in England, we cannot fail to see how all the work in this branch of science is facilitated by the character of the English people, who, conservative as they are, apply themselves zealously to everything new, the practical necessity of which they are convinced of, and do away with all minor obstacles, especially the financial ones. No book reading can give us a full idea; we have to come and look ourselves, to become acquainted with the numerous institutions devoted to the welfare of mankind, and to get familiar with the great questions of self-government, the deficiencies of which, especially the frequently contradictory character of its local institutions, we must, however, not overlook. Certainly it is with the highest interest that we study the institutions of England. But, besides

the practical work done in England, we have to admire the progress in the science of hygiene, flourishing in England at a time when the German universities just began to give their attention to the subject. We are in duty bound gratefully to acknowledge the great progress in the science of hygiene, which is due to the influence of the school at Netley. And of the many eminent men who worked there I mention one who is no longer among us, but whose memory will be dear to every one who takes an interest in the welfare of our soldiers and in the progress of our science—Edward Alexander Parkes. Till his death in 1876, his lectures at Netley attracted all those who took an active interest in the progress of hygiene. A man of the highest faculties, with an almost womanly tenderness of heart, and with the purity of a child, he was sure to make the deepest impression upon his fellow-workers. A lasting monument of Parkes is his "Manual of Practical Hygiene," which has become the base for extensive hygienic work. And we must not forget to mention his friend and successor, De Chaumont, who proved to be his best fellow-worker, and who did some eminent work in questions of practical hygiene. On this important occasion I thought it right to recall the memory of these two eminent workers in our branch of science. I conclude by expressing the wish that it will be the spirit of Parkes which will guide the transactions of this Congress. The Parkes Museum was the first institution to allow of a practical instruction in hygiene; at the same time it shows what his ideas, his aims, were as to the generalization of hygienic knowledge. May this Congress follow his steps, and may its work tend to impart to wider and wider circles that which Parkes called the aim of his life—purity and light! (Cheers.)

Sir James Paget then rose to move a vote of thanks to the Prince of Wales for presiding. He said he thought that they should offer their most cordial thanks to His Royal Highness for his goodness in accepting the office of president, and for the manner in which he had conducted the business of that day. (Cheers.) He might, perhaps, be permitted to say that none knew better than himself the immense advantage that the Congress would derive from the presidency of His Royal Highness, for none could remember more clearly the great advantage which was derived by the International Medical Congress in 1881 from His Royal Highness's patronage, and from his presence on the first day of its meeting. His Royal Highness might well approve of the design and purpose of the Congress; for if one might define, or attempt to define, that purpose, it would be that of attempting to find out the means by which the population of every nation in the world might attain, as soon as possible, the highest possible level of health both of body and mind. Every section of the Congress was a part of one great design; its work was undertaken in concord with that of all the other sections, was open to the criticism of every other division of the Congress, and was ready to work in concord with all others to a common end. (Cheers.) That was indeed well shown, not only in the width, but in the variety, of the subjects which were to be considered in the Congress. As one looked through them, one could not but suspect that some who called themselves

very practical men might think that there was a good deal in the programme that could never come to anything like utility. The whole history of science would show that the highest utility had commonly been derived from the profoundest depths of scientific research. (Cheers.) He would urge the necessity of the pursuit of the most scientific subjects as tending necessarily to the advance of knowledge in regard to the national health. That was the reason why Governments might well encourage the investigation of those subjects. It would be well for the voice of that unanimous Congress to make it clear to every Government in the world that it was part of its duty to promote the cultivation of the deepest scientific research as much as it was to promote the ordinary routine work necessitated by sanitary progress. (Loud cheers.)

Dr. George Buchanan (Chief Medical Officer of the Local Government Board) seconded the vote. He said:—It is my privilege to second Sir James Paget's resolution, expressing on behalf of this Congress its gratitude to His Royal Highness for accepting the office of its President, and for his gracious address.

We may take the object of our Congress to be twofold; on the one hand to make occasion for sanitary workers from all parts of the world, and for labourers in every department of sanitary science, to compare their experiences, and to learn from each other; and, on the other hand, to help towards an adequate recognition by the public of their own concern in sanitary progress—assisting each community to understand what can be done for the prevention of disease and for the prolongation of healthy life, while helping each community and the several members of the community to see what each one has the power and the duty to do.

Our Congress, holding in view this twofold object, is sensible that it could not possibly set to work under more auspicious conditions, or with greater assurance in the success of its labours, than under the presidency of His Royal Highness, and after hearing his encouraging address. I need say no more to ensure your emphatic assent to Sir James Paget's proposition.

The vote of thanks was carried with enthusiasm.

His Royal Highness the Prince of Wales, who was received once more with hearty cheering, said:—If I have to undergo the ordeal of returning thanks for the proposal which has been made to you, the ordeal has been made a very pleasant one by the very kind terms in which my old and valued friend Sir James Paget has introduced it. I must also offer my most sincere acknowledgments for the very kind way in which you have received it. We have all heard with the deepest interest the addresses which have fallen from the lips of those distinguished foreign delegates who have addressed us to-day. Those who are familiar with the languages in which they spoke cannot but have been deeply impressed by what they said. It would be superfluous in me to hark back, if I may use the term, to the subject that is before the Congress and to allude further to what I had the honour to say to you, and to what has fallen from the lips of much abler men. But most heartily do I congratulate the Congress on the large attendance of to-day, which

augurs well for the work that they have before them. If the time they have before them is unfortunately not long, I am sure we have reason to be very grateful to those distinguished men from all the different countries in the world who have attended here to-day and intend to give their valuable assistance during the work of the Congress. The outside public may occasionally sneer at the word "Congress"; but I have little doubt that the interchange of ideas between ourselves and our friends on the matters of importance which will be discussed will, if we can arrive at a just conclusion, benefit not only our own country and our own cities, but other countries also, by introducing such sanitary measures as shall decrease disease throughout the world. If this result be attained we shall not have lost time, in the work which we are going through this week. (Cheers.)

The meeting then adjourned, "God Bless the Prince of Wales" being played upon the organ as His Royal Highness left the Hall.

THE PROCEEDINGS

OF

SECTION I.

PREVENTIVE MEDICINE.

OFFICERS OF THE SECTION.

PRESIDENT.

Sir Joseph Fayrer, K.C.S.I., LL.D., M.D., F.R.S., Q.H.P.

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Professor Dr. da Silva Amado.
Overlæge Bentzen.
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Dr. Duncan.
Professor Dr. Ferd. Finkelnburg.
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Dr. Guillaume.
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Professor Dr. M. von Pettenkofer.
Dr. Pistor.
Professor Dr. Proust.
Dr. Rochard.
Surgeon-General Roth.
Professor Dr. Mariano Semmola, Senator.
Professor Dr. Skrzeczka.
Professor Stokvis, M.D., LL.D.
Professor Dr. Tommasi-Crudeli, Senator.
Professor Vallin.
Professor Dr. Rudolf von Virchow.
Dr. David W. Yandell.

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Sir John Banks, K.C.B., LL.D., M.D.
Deputy Surgeon-General Bostock, C.B., Q.H.S.
George Buchanan, M.D., F.R.S.
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Shirley Forster Murphy.
Arthur Ransome, M.D., F.R.S.
J. W. Tripe, M.D.

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Charles E. Paget, Salford.
Dr. Prosper de Pietra Santa, Paris.
H. J. Paine, M.D., J.P., Cardiff.
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Francis Vacher, F.R.C.S., F.C.S., Birkenhead.
E. F. Willoughby, M.D., London.

HONORARY SECRETARIES.

Sidney Martin, M.D.
Isambard Owen, M.D.
Edward Seaton, M.D.

SECTION I.

PREVENTIVE MEDICINE.

Tuesday, 11th August 1891.

The Chair was successively occupied by :—

The President, SIR JOSEPH FAYRER, K.C.S.I., M.D., etc.;
Professor Dr. BROUARDEL (Paris);
Professor Dr. DA SILVA AMADO (Lisbon);
Sir JOHN BANKS, K.C.B., M.D. (Dublin).

Presidential Address.

BY

Sir JOSEPH FAYRER, K.C.S.I., LL.D., M.D., F.R.S., Q.H.P.

My first duty on occupying this seat is to make fitting acknowledgment of the honour which has been conferred on me, and to assure those to whom I am indebted for it, that, as I appreciate the distinction highly, so, with the aid of my colleagues in this section and the support of the many eminent men of science who will take part in its work, I hope to discharge faithfully the important trust reposed in me.

My next and most agreeable duty is to offer to all who honour us with their presence, or who propose by co-operation to forward the objects of the Congress, a most hearty welcome and cordial recognition of the interest in it manifested by their presence; to express a hope that the deliberations and conclusions which result from their wisdom and experience may advance our knowledge and tend to enhance the welfare of the human race.

This hope is based upon the universal recognition of the need of and capacity for improvement in the conditions upon which physical well-being, immunity from disease, and prolongation of life depend; and this is evinced by the assembling together in this Congress of men of science from all parts of the world, who have devoted themselves to the great international, humanitarian purpose of ameliorating the conditions of mankind everywhere, so far at least as the application of the laws of health, and to some extent those of sociology can effect this consummation.

To all, then, we in this great city, who are interested in the progress of Hygiene and Demography, offer our cordial greeting, and express an earnest desire that our visitors may derive pleasure and

benefit from their sojourn in London, and from the proceedings of the great assembly of which they form so important a part.

Before I invite Dr. Cuningham to open the first subject for discussion, it is right that I should make a few preliminary remarks on the general scope and objects of the work comprised in this section. I do not intend to occupy much of the short and valuable time at our disposal by discussing any special subject, or by anticipating that which those who follow me may have to say, but shall confine myself to a brief notice of the present aspects of Preventive Medicine, its recent development, how much it has operated and is now operating for the public good, how slowly but surely it is dispelling the cloud of ignorance and prejudice which has overshadowed and impeded the progress of sanitation, and how it is gradually imbuing the public mind with the conviction that prevention is better and often easier than cure, that health may be preserved, disease avoided, and life prolonged by the study and observance of certain well-known laws, which, correlating the individual with his surroundings, determine his well-being when conformed to, deteriorate or prevent it when neglected, and should enforce the maxim "venienti occurite morbo."

Unprecedented progress in human knowledge characterises the present century, and has not been wanting in Preventive Medicine; it is, however, during the last half of it that advance has been most remarkable, whilst it is in a later part of that period that it has so established itself in the popular mind as to have passed from the region of doubt and speculation into that of certainty.

It is now pretty generally understood that about one-fourth of all the mortality in England is caused by preventable disease, that the death-rate of large communities may be reduced much below that at which it has been wont to stand, the average duration of life may be made to approximate nearer to the allotted four score, and that the conditions of living may be greatly ameliorated. The chief obstacles to improvement have been ignorance and want of belief; a better knowledge of the laws of life and health, a more rational comprehension of the nature and causes of disease, are gradually but surely entailing improvement in the conditions of living and in the value of life, and the diminution and mitigation, if not extinction, of morbid conditions which have in past times proved so injurious or destructive to life. In short, as Dante says:

> "Se' l mondo laggiù ponesse mente
> Al fondamento che natura pone,
> Seguendo lui avria buona la gente."
>
> Paradiso, viii., 142.

The subjects contemplated in the work of this section all bear upon the preservation of health and the prevention of disease, and, as far as time permits, the most interesting of them will be discussed. Those selected are of great importance in their relations to public health; let us hope that observers who have formed their opinions from experience in other countries and under different circumstances may throw new light on them.

In the brief space of time at my disposal, it would be impossible to give a continuous outline of the progress of Preventive Medicine during the past, or to trace its growth and development out of ignorance and superstition to its present well-established foundation on a scientific basis. It is of happy augury for mankind that the subject of public health is now fairly grasped by popular sentiment, and that, though ignorance, opposition, and vested interests still contest the ground, progress is sure, and the light of science is illuminating the dark places. It is now better appreciated than it ever has been, that the causes which induce disease and shorten life are greatly under our own control, and that we have it in our power to restrain and diminish them, and to remove that which has been called "the self-imposed curse of dying before the prime of life."

It is indeed only recently that the resources of medical science have been specially devoted to the prevention as distinguished from the cure of disease, and how far successfully, I hope in a few words to show, whilst I trust the proceedings of the various sections of this Congress will indicate how much remains to be done.

Did time permit, I might illustrate the progress of Preventive Medicine by contrasting the state of England with its population of more than 29,000,000 during the Victorian, with the England of the Elizabethan age with its 4,000,000. I might remind you of the frightful epidemics which had devastated the land in the forms of black death, sweating sickness, plague, petechial typhus, eruptive fevers, small-pox, influenza, and other diseases, such as leprosy, scurvy, malarial fever, dysentery, &c., of the wretched mode of living, bad and insufficient food, filthy dwellings, and ill-built towns and villages, with a country uncultivated and covered with marshes and stagnant water;—[according to Defoe one-fifteenth part of England consisted of standing lakes, stagnant water and moist places, the land unreclaimed, and with the chill damp of marsh fever pervading all]. The homes of the people were wooden or mud houses, small and dirty, without drainage or ventilation, the floors of earth covered with straw or rushes, which remained saturated with filth and emitting noxious miasmata. The streets were narrow and unpaved, with no drains but stagnant gutters and open cesspools, while the food was principally salted meat with little or no vegetable. To this may be added a large amount of intemperance and debauchery. As it is, I can only just allude to them.

In such conditions disease found a congenial nidus, and by a process of evolution assumed the various epidemic forms which proved so destructive to life. Some of these have gone, let us hope never to return, and the conditions which fostered, if they did not cause them, have gone also. Can we venture to hope that it will be the same with those that remain; our immunity during the last diffusion of cholera gives some ground for thinking it may be so, if, indeed, the legislature and popular intelligence should be of accord on the subject.

If we turn to the present, we find that great improvements have gradually been made in the mode of living; the houses are better constructed, the drainage and ventilation are more complete, the land

is better cultivated, and the subsoil better drained; marsh fever and dysentery, at one period so rife, are unknown, and leprosy has long since disappeared. The death-rate is considerably reduced, and the expectancy of life enhanced. Water is purer, food is more varied and nutritious, clothing is better adapted to the climate, the noxious character of many occupations has been mitigated, and the mental, moral, and physical aspects of the people altogether improved; education is general, a better form of government prevails, and the social conditions are far in advance of what they have been; but still the state of our cities, our towns, and water supply show that improvement is demanded, and one object of this Congress is to point out why and how this may be effected, not only in this country, but throughout the world.

If we inquire into the effects of certain well-known diseases, we find that they are less severe in their incidence, if not less frequent in their recurrence.

With regard to Small-pox, since the passing of the first Vaccination Act in 1840, the death-rate has diminished from 57·2 to 6·5 per 100,000 for 1880–84, though for the five years 1870–74, it was 42·7, thus showing that there was still much to be learnt about vaccination.

Enteric fever was not separated from Typhus before 1869, but since then the death-rate has decreased from 0·39 to 0·17 per 1,000, and it has been shown that this improvement was synchronous in different parts of England with the construction of proper drains.

The diminution in the death-rate from Typhus is quite as striking, and this also is shown to have run parallel with improved sanitation in more than one large town.

The death-rate from Scarlatina fluctuated between 97 and 72 per 100,000 between the years 1851 and 1880, and though it has diminished considerably of late years (17 per 100,000 in 1886), a corresponding increase in the death-rate from Diphtheria has taken place; this may be due in part to a better differentiation of the two diseases.

In 1858 it was reported that Phthisis killed annually more than 50,000 people; the death-rate from this disease has not decreased very much for England and Wales, but it has done so in some large towns, notably in Liverpool, and Dr. Buchanan and Dr. Bowditch of Massachusetts, both showed a striking parallelism between the diminution of the death-rate from this cause, and the drying of the soil resulting from the construction of sewerage works.

Cholera first appeared in England in 1831, and there were epidemics of it in 1848–49, 1853–54, and 1865–66, bnt the number of deaths diminished each time it appeared, and though it has been present since, it has never reached the height of an epidemic. This is fairly attributable to local sanitary rather than to coercive measures.

Preventible disease still kills yearly about 125,000, and considering the large number of cases for every death, it has been calculated that 78¼ millions of days of labour are lost annually, which means 7,750,000*l.* per annum; this does not include the days lost by the exhaustion so

often induced by the still too numerous unhealthy houses of the poor.

Towns, villages, and houses are still built in an insanitary way; the death-rate is still higher, and the expectancy of life lower than it should be, and though we have got rid of the terrible plagues of the middle ages, yet in this century, now closing, other epidemics have made their appearance; cholera has four times visited us; fevers, eruptive diseases, and diphtheria have prevailed; influenza has appeared several times, even recently, and after leaving us last year only to return with renewed virulence, caused in the United States a mortality almost equal to that of the plague.

Much has been done, and a great deal of it in what is called the pre-sanitary age, but much remains to be effected; let us hope that the future may be more prolific of improvement than the past; international philanthropy seems to say it shall be so.

That we can exterminate zymotic disease altogether is not to be expected, but there cannot be a doubt that we may diminish its incidence, and though we may never be able to reach the "fons et origo mali," yet we can make the soil upon which its seed is sown so inhospitable as to render it sterile.

The scope and objects of Preventive Medicine are not limited to the removing of conditions which give rise to zymotic disease, nor even of those which compromise otherwise the physical welfare of mankind, but should extend as well to a consideration of the best means of controlling or obviating those which, attending the strain and struggle for existence, involve over-competition in various occupations, whether political, professional, or mercantile, by which wealth or fame is acquired or even a bare livelihood is obtained, and under the pressure of which so many succumb, if not from complete mental alienation, from breakdown and exhaustion of the nervous system, which give rise to many forms of neurotic disease and add largely to the numbers of those laid aside and rendered unfitted to take their due share in the natural and inevitable struggle for existence.

Or I might point to the recrudescence of those psychical phenomena manifested by the so-called hypnotism or Braidism,—morbid conditions arising out of the influence of one mind upon another; this is a subject which demands not only further investigation, but great precaution as to its application, and claims the watchful notice of Preventive Medicine on account of the dangerous consequences which may ensue from it.

Again, the abuse of alcohol, opium, chloral, and other stimulants and narcotics, and the evil consequences which may result therefrom, is also a subject worthy of consideration, and will no doubt receive it in a communication which is to be brought before this section.

The possible deleterious influence of mistaken notions of education as evinced in the over-pressure which is exercised upon the young, the predominence of examinations, their increasing multiplication and severity, and the encouragement of the idea that they are the best test of knowledge, whilst true mental culture is in danger of being neglected and physical training, if not ignored, left so much to individual inclination,—

this is another subject which demands the jealous scrutiny of Preventive Medicine, whose duty it is to safeguard the human race from all avoidable causes of either physical or mental disease.

Another important subject is that which concerns the food of the people, and especially of the rising generation. The possibility of danger arising from the consumption of the flesh or milk of diseased animals, the methods generally of providing animal food demands some consideration and is well entitled to the thoughtful attention of Preventive Medicine.

Though Preventive Medicine in some form has been practised since the days of Moses, yet it has received but little recognition until a comparatively recent period; when science developed and observation extended, medical men and others became impressed with the influence of certain conditions in producing disease, and thus it was forced upon the public conscience that something must be done; and when philanthropists like John Howard devoted life and property to the amelioration of such awful conditions as existed, *e.g.*, in our jails, where the prisoners not only died of putrid fever, the result of ochletic causes, but actually infected the judges before whom they came reeking with the contagion of the prisons, rude sanitary measures gradually came into operation and partially obviated these evil conditions, but it was not before the middle of this century that any scientific progress was made; it was when Chadwick, Parkes, Southwood Smith, and others initiated the work by which they have earned the lasting gratitude of the human race, that Preventive Medicine became a distinct branch of medical science.

The sanitary conditions of towns and communities is not dependent on the views or exertions of individuals alone, for they are and have been for the last fifty years largely cared for by the legislature and a variety of Acts have been passed which deal with questions concerning the public health; indeed, were all the provisions enforced, little would remain to be desired on the part of the executive Government, but as many of them are permissive, not compulsory, the benefit is less complete than it might be. The old difficulty of prejudice combined with ignorance, still too often stands in the way, and despite evidence which on any other subject would be conclusive, the most obvious sanitary requirements are often ignored or neglected. Many thousands of lives have been saved by the Sanitary Acts now in force; but there is little doubt that more thorough organisation under State control, as under a Minister of Public Health, would have most beneficial results, and would save a great many more, but be it always remembered that sanitary measures must be based on the results of experience and observation—not on mere theories of causation.

We must acknowledge, however, that we are much indebted to the action of the Government Local Board, who have already expended upwards of nine million pounds on sanitary work, and under whose able administration the most crying evils are gradually being rectified. Through the wise precautions enacted by it against the importation and diffusion of epidemic disease, when other parts of Europe were

affected by cholera, this country escaped, or so nearly so as to suggest if not to prove that it was to sanitary measures we owed our immunity.

That there is something in the nature of epidemics which brings them under the dominion of a common law as to their extension seems certain; that there is much about them we do not yet grasp is equally true, but it is as surely the case that local sanitation is the preventive remedy, as it is that coercive measures to arrest their progress are unavailing

Under the improved system of sanitary administration, which now obtains, and is gradually developing to a greater state of perfection, the sanitary administration of every district in the country is entrusted to the care of duly qualified health officers,—a system from which excellent results have already accrued, and from which better still may be anticipated.

The records of the past fifty years prove the influence exerted by sanitary measures on vital statistics.

The first reliable tables from which the expectancy of life may be derived show that in 1838 to 1854 it was for males 39·91, for females 41·85 years; by the tables of 1871 to 1880 it had increased to 41·35 for males, and 44·66 for females. It is shown also that the expectation of life increases every year up to the fourth year, and decreases after that age. For males up to 19 years it is higher by the last tables, but after that age it is higher by the old table; for females it is greater by the new table up to 45, but after that age it is less.

The improved sanitation saves more children's lives, but the conditions of gaining a living are harder than they were at the time of the first table, which accounts for the expectancy of life for adult men being less. Women remain more at home where the better sanitation tells, and are not subject to quite the same conditions as men, so that their expectancy of life is greater than by the old tables up to the age of 45.

A further proof of the effects of sanitary work is a decreased death-rate. Let us compare the death-rates of England during past times with the present; whether they be equally significant for other countries, I cannot say, but these at all events sufficiently prove the point in question.

Death-rate.

1660–79	80	per 1,000.
1681–90	42·1	„
1746–55	35·5	„
1846–55	24·9	„
1866–70	22·4	„
1870–75	20·9	„
1875–80	20·0	„
1880–85	19·3	„
1885–88	18·7	„
1889	17·85	„

In some parts of England, where the main object is the recovery or maintenance of health, the death-rate is down to 9 per 1,000, while in others, where the main object is manufacture and money-making, it is as high as 30 per 1,000.

Nowhere, I think, have the beneficial results of sanitary work been better illustrated than in India during the past thirty years. A Royal Commission was appointed after the Crimean War to inquire into the sanitary condition of the British Army, and this in 1859 was extended to India. The European army was the special subject of it, but the Native troops were referred to incidentally. Here the inquiry had to deal with a large body of men, concerning whom, their conditions of existence being well known, reliable information was accessible. It was ascertained that up to that time, the annual death-rate over a long period had stood at 69 per 1,000. The inquiry resulted in certain changes and improvements in the housing, clothing, food, and occupation of the soldier. Since these have been carried out, there has been a steady decline in the death-rate, and the annual reports of the Sanitary Commissioners to the Government of India give the rates as—

1886	- - -	15·18 per 1,000.
1887	- - -	14·20 „
1888	- - -	14·84 „

During some years it has been even lower, down to 10 per 1,000, whilst the general efficiency of the troops has increased. It is not easy to estimate the money equivalent of this, but if we take the rough standard which values each soldier at 100*l.*, a simple calculation will show how great is the gain, and who can estimate the value of lives saved and suffering avoided?

As to Native soldiers with whom the European troops may be compared, I find that the death-rate was—

in 1886	- - -	13·27 per 1,000.
in 1887	- - -	11·68 „
in 1888	- - -	12·84 „

Famine, cholera, and other epidemic visitations in some years disturb the regularity of the death rate; under less favourable conditions of living, as in the case of prisoners in the jails, it is somewhat higher.

In the Indian jails, for example, it was—

in 1886	- - -	31·85
in 1887	- - -	34·15
in 1888	- - -	35·57

On the whole, all this indicates improvement, but it is to be noticed with regret that during the last five years there has been a tendency to revert to a higher death-rate and per-centage of sickness. Let us hope this will prove only transitory; the attention of sanitary authorities both at home and in India is anxiously directed towards the removal of whatever may be the cause of it.

As regards the civil population progress also is being made; but here, from so many disturbing causes, the figures are neither so easily obtained nor so reliable. The comparatively large mortality is due to

neglect of the common sanitary laws added to extremes of climate, which favour the incidence and diffusion of epidemic disease, and intensify it when it has once appeared.

"It is shown both by the vital statistics and the history of the chief diseases, that there is in India an enormous amount of preventable sickness and death." A. S. C.'s Reports for 1889.

A Sanitary Department has existed in India since 1866, and every effort is made by Government, at no small cost, to give effect to sanitary laws; there can be little doubt that the results, so far, are good, that disease generally is diminishing, and that life is of longer duration.

An important result of the observations of the able medical officers of the Sanitary Service of India has been to show that cholera is to be prevented or diminished by sanitary proceedings alone, and that all coercive measures of quarantine or forcible isolation are futile and hurtful. Here I may say that large as may appear the death-rate from cholera in India (*i.e.*, in 1888, 1·99 per 1,000 for the European army and 1·35 for the civil population), it is small compared with that of fevers, which caused, in 1888, 4·48 per 1,000 in the European army and 17·09 in the civil population; but there is every reason to believe that on the whole these also are becoming less fatal under the influence of sanitary measures.

In preventive as in curative medicine, knowledge of causation is essential. It is obvious that any rational system of proceeding must have this for its basis. A certain empirical knowledge may be useful as a guide, but no real advance can be expected without the exactitude which results from careful scientific observation and induction; the spirit of experimental research, however, is now dominant, and progress is inevitable. How much we owe to it is already well known, whilst, under its guidance, the reproach of uncertainty which attaches to medicine as a science is disappearing. Recent advances in physiology, chemistry, histology, and pharmacology have done much to throw light on the nature and causes of, and also on the means of preventing or of dealing with disease.

It is impossible to exaggerate the value of the scientific researches which have led to the antiseptic methods of preventing the morbific action of micro-organic life, whether the toxic effects produced by them, or those induced autogenetically in the individual. Theory has here been closely followed by its practical application in prevention and treatment of disease, whilst the study of bacteriology, which is of such remarkable pre-eminence at the present time, is opening out sources from which may flow results of incalculable importance in their bearing on life and health. That the conclusions arrived at are always to be depended on I doubt, and it seems that scientific zeal may perhaps sometimes outrun discretion. Is it too much to recall the caution uttered by Dante, to beware of

> "Immagini di ben seguendo false
> Che nulla promission rendono intera."
>
> Purgatorio, xxx., 131.

That it might be wiser to postpone generalisation has, I think, been more than once apparent, whilst the expediency of further investigation before arriving at conclusions which may subsequently prove to be erroneous, should not be lost sight of; but it has probably ever been so in the course of scientific progress, that in the enthusiasm of research, which is rewarded by such brilliant results, early generalisation has too often been followed by disappointment, and it may be by temporary discouragement of hopes which seemed so promising.

It would be well to bear in mind a caution recently given by the Duke of Argyll, "that we should be awake to the retarding effect of a "superstitious dependence on the authority of great men, and to the "constant liability of even the greatest observers to found fallacious "generalisations on a few selected facts."* Still it is in the region of scientific research by experiment that we look for real progress, and we can only deplore the mistaken sentiment, the false estimate, and the misconstruction of its aspirations and purposes, which have placed an embargo on experiment on living animals, rendering the pursuit of knowledge in this direction well-nigh impossible, if not criminal; whilst for any other purpose, whether of food, clothing, ornament, or sport, a thousandfold the pain may be inflicted without question. The inconsistency of the sentiment which finds unwarrantable suffering in an operation performed on a rabbit, when the object is to preserve human or animal life or prevent suffering, but which raises no objection to the same animal being slowly tortured to death in a trap, or hunted or worried by a dog, needs no comment; whilst the spirit which withholds from the man of science what it readily concedes to the hunter, is, to say the least, as much to be regretted as it is to be deprecated.

It must be remembered that, important as are the researches into microbiology, there are other factors to reckon with before we can hope to gain a knowledge of the ultimate causation of disease. It is not by any one path, however closely or carefully it may be followed, that we shall arrive at a full comprehension of all that is concerned in its etiology and prevention, for there are many conditions, dynamical and material, around and within us of some of which we are as yet perhaps altogether ignorant, which have to be considered in their mutual relations and bearings before we can hope to do so; still I believe we may feel satisfied that the causes of disease are now being more thoroughly sought out than they ever have been,—all honour to those who are prosecuting the research so vigorously,—and that though individual predilection may seem sometimes to dwell too exclusively on specific objects, yet the tendency is to investigate everything that bears upon the subject, and in the practical application of the knowledge which has been acquired, to emphasise all that is implied in the aphorism, "salus populi, suprema lex."

* "Nineteenth Century," April 1891.

The Mode of Preventing the Spread of Epidemic Disease from One Country to Another.

BY

Surgeon-General J. M. Cuningham, C.S.I., M.D.

What is epidemic disease, and what are the special forms of epidemic disease with which we are concerned in this inquiry? The term "epidemic" is somewhat vague. It is generally employed in contradistinction to "endemic" and "sporadic." But diseases which are markedly "endemic" in their character often become "epidemic" within the countries where they are specially localised. For example, epidemics of malarious fever are common in countries where such diseases are constantly present. Or if we take other diseases which are not so specially localised, a disease which is ordinarily represented by a few isolated or so-called "sporadic" cases may become "epidemic," and number hundreds or even thousands of cases. Of this, small-pox is a striking example, for even in our own country we find it rise and fall in a very remarkable way—a very few cases in one year, and then a very great many cases in another year. The truth is, these terms, "endemic," "epidemic," and "sporadic," cannot be logically defined, especially the two last of them, which merely mean different degrees of prevalence or absence of disease. Regarding their proper use there is no law, and as a matter of fact they are employed differently by different observers. Cases which one observer describes as merely "sporadic," or altogether independent of one another, would be regarded by another observer as undoubtedly "epidemic"—as valuable indices of that movement which is characteristic of epidemics, and without mention of which their history would be altogether incomplete. But we need not pursue this subject further. The question we have to deal with is a practical question, and so far as the term "epidemic" in the heading of this paper is concerned—a heading, I may observe, which was given me as the subject on which I might offer to the Congress a few remarks—I apprehend that it is intended to refer to those diseases which are always present in certain parts of the world with greater or less intensity, generally confined to them, but every now and again over-leaping their ordinary boundaries and invading other countries from which as a rule they are altogether or almost altogether absent. In regard to such diseases we have the feature of movement which we have already mentioned as characteristic of epidemics—the disease is heard of as prevailing beyond its ordinary bounds, it is evidently moving, it advances sometimes gradually and steadily, at other times in leaps and bounds, and in every country the question soon arises,—Is it coming here, and what can be done to prevent its coming? Practically the only disease to which this description fully applies is cholera. Small-pox is already present. Malarial fevers never invade other countries. Influenza has of late afforded a very striking example of an epidemic, but it seems

hard to say where it came from, if it be the fact that it did come from any special part of the world. Yellow fever, be it of malarial or other origin, has very rarely gained any serious hold over places far from its ordinary home. Leprosy has recently attracted attention as a disease which may be expected to extend its limits under the altered conditions of this closing nineteenth century, bnt there is no evidence to this effect. Of cholera, however, most countries have had sad experience—of its power there has been abundant proof, and no more important question could well engage attention in regard to epidemics than how this power may be most successfully combated. We may therefore take cholera as specially *the* epidemic disease with which we have to deal, and it will serve also as a type of all others of the same or similar class, because the measures which are the best to be taken against cholera will also be found the best where other diseases are concerned.

If it be difficult to define the word "epidemic," it is equally difficult to find a word to express the advance of an epidemic—the increase in the number of attacks, and the extension of the area affected—without involving some theory as to the cause of the disease. When we talk of "spread," although this is as good a word as any, the idea is presented that this cause is something which is being multiplied; that the cases already existing are the cause of other cases, and that these again will be the cause of many more; in the present day, no doubt, this is the popular doctrine both with the profession and the public. The epidemic of cholera is attributed to human intercourse, to the movement of travellers and their effects, or of merchandise in its varied catalogue. There are many who hold that if this movement could be traced back and back it would ultimately end in the discovery of the specific cause which had been exported from its home. They think, moreover, that if all intercourse could be absolutely and entirely stopped, then cholera could never leave this home which it is supposed to have in the delta of the Ganges, and would be just as incapable of appearing in Europe or any other country outside these lower parts of Bengal as any other article of exclusively local production. Now I mention this opinion, not with the object of discussing it, or of raising any discussion upon it, bnt rather in order to say that I shall not discuss it or any other theory in regard to cholera. I shall confine myself to facts, and from these facts endeavonr to deduce an answer to the important question—What is the best mode of preventing the spread of epidemic disease from one conntry to another?

I mention it also because it forms the basis of the *first* of those modes which I shall consider, the main, and indeed, I might say, the only mode which has been adopted in many countries to protect them from epidemics, and which is known under the name of quarantine. Qnarantine in respect of cholera aims at two things: it aims first at preventing the export of a cholera-producing material from any country in which the disease may exist; and secondly, it aims at preventing the importation of such material into another conntry. It may be divided into land quarantine and sea qnarantine, but the impracticability of any such measure by land has been almost nniversally recognised, and the

attempt may be said to have been given up except when for the time unreasoning panic has seized the authorities and induced them to have recourse to measures which in calmer moments they would never have attempted. Sea quarantine endeavours to attain its object by not allowing ships to enter the port of arrival and discharge their passengers and cargo, unless they had a clean bill of health on starting, unless they have been healthy during the voyage, and, in the case of vessels coming from suspected places, unless they have been subjected to a certain period of observation, which varies according to circumstances. It is not necessary to describe all the procedure in detail, the confinement of the passengers in lazarettos, the disinfection of the cargo, and other parts of the system. The question is—Has this system done any good? The answer is, emphatically—No! No case can be adduced in which the exemption of any country can be proved to have been due to quarantine; or, admitting that in a case of this kind absolute proof is difficult and perhaps impossible, no instance can be adduced in which there are good grounds for believing that such exemption has been due to quarantine. The mere escape of any particular place in which quarantine was carried out is in itself no proof that the one was the consequence of the other. We must remember the fickle nature of cholera, which is exemplified in every epidemic—how it attacks one place and exempts another, it may be, close by. Year after year statistics illustrate this characteristic, and show that, even in areas where the epidemic has been severe, a large proportion of towns and villages escape altogether. Every case in which credit is claimed for quarantine because it appeared to have either postponed attack or warded it off entirely must be carefully considered, and the evidence in favour of such a view submitted to thorough examination. I know no case put forward in favour of quarantine which can stand such examination. An island would afford the best illustration, but islands seem only to supply illustrations of its failure, as exemplified in Malta and Sicily, with their oft-repeated epidemics. Australia has been cited as an instance of safety arising from quarantine, as regards both small-pox and cholera. Being an island continent, it is a good case for investigation, and I am glad to see that a separate paper upon it is to be read before this Congress. But if, as I believe, there are no cases in which quarantine has beyond all reasonable doubt succeeded, there are endless cases in which it has signally failed. The history of cholera over the world, and especially in Southern Europe, is a consistent history of the failure of the whole system, and the marvel is that after so many years of failure it should yet be upheld and continued in any part of the globe.

The truth is that as it was originally based on theories, so it is continued on theories, with little regard to facts or experience. It proceeds on the assumption that ships are the great means by which cholera moves from one country to another; and, in particular, that if the narrow neck at the entrance to the Red Sea could but be subjected to the strictest quarantine, Europe would be safe from cholera. But, as a matter of fact, ships, especially along this Red Sea route, are wonderfully exempt from cholera; and the chief ports on this main line of communication

with Europe—Aden, Suez, and Egypt generally—have a history singularly free from cholera epidemics, and have enjoyed an immunity from the disease such as few places in the world can boast of. No European epidemic of cholera has ever been traced to this route, even by those who have searched diligently in hope of finding evidence in favour of this conclusion. On the other hand there is ample evidence that several of these epidemics have advanced not by the sea route at all, but by land. The authorities which regulate the imposition and withdrawal of quarantine are very anxious to learn all about the current history of cholera in the East. It is extraordinary how little their action seems to be regulated by what is going on in Europe. Year after year the same vexatious interference with arrivals from the East takes place, when often, at the very time of such interference, cholera is prevalent, and has perhaps been for months prevalent on the other side of the Mediterranean. A more or less complete history of cholera exists for the past sixty-two years—1829–1890. As regards many of them the information is defective, but we know that in thirty-nine of them cholera was present in some part of Europe, often very severely, and lasting for a great part of the year. To attempt to protect Europe from cholera when cholera was already there, and human intercourse free all over the continent in every direction, is one of those extraordinary proceedings which seem to attach to the unreasoning nature of quarantine.

The freedom of Egypt and of the Red Sea route generally from cholera will doubtless be ascribed by some to quarantine, and will be claimed as an example of the benefits of quarantine. The condition of vessels leaving Indian ports, they argue, is now subject to regulations, they are under inspection all along the route, therefore ships rarely suffer, and the ports where they stop are rarely affected. But, unfortunately for this argument, the state of matters shows no change now from what it was before such precautions were taken. The Red Sea route was opene in 1842; in 1869 a vast increase of traffic commenced with the opening of the Suez Canal, but these changes, great as they are, have brought no changes in the history of cholera.

This point is of great importance, because in these days of rapid communication the advocates of quarantine believe that they have a new and powerful argument in their favour. People and merchandise of all kinds, they say, now pass so quickly from places where disease is prevalent to other places where it does not exist, that there is much greater risk of bringing it than there used to be in the days of slow travelling, and therefore there is all the greater need for strict quarantine. But this argument, like all the other arguments advanced in support of these restrictions, is purely hypothetical, and is opposed to actual facts. These later years of rapid communication have not brought with them more frequent or more rapidly extending epidemics. Quite the reverse. Whether in India or in Europe experience is the same. The more rapid means of communication have effected no change in the behaviour of cholera. Epidemics of this disease travel no quicker in these days of railroads and steamboats than they did a hundred years ago, in the days of bad roads and coasting craft of the most primitive description. Nor

has the direction of epidemic movement been altered. This is true of India, and it is equally true of Europe, where, as we have already seen, cholera has been present in at least thirty-nine out of the last sixty-two years; but in none of these has there been a general diffusion of the disease. In spite of railways running in every direction and of the freest and most rapid communication between different countries, even in these later years cholera has been generally confined to one or two of the many countries of which Europe consists; and there has been no co-relation between the extension of cholera and the facilities for human intercourse.

The question with which we are concerned is a purely practical one. If quarantine has really proved beneficial, where is the evidence of the benefits it has conferred? Those who uphold the system are bound to produce such evidence, if they can, to justify its continuance; for if it confers no benefits it beyond all question causes the most serious evils. The delay of travellers, often unexpected and always indefinite, their detention in what is virtually a prison, under circumstances most favourable to disease; these are bad enough, and few experiences in life can be more vexatious. In addition, there is the derangement of commerce, the expense entailed in keeping ships and crews doing nothing for days, and it may be for weeks, and all this ordered frequently at the last moment, so that until actual arrival it is impossible to say whether quarantine will be imposed or not, and if so for how long. Whatever may be thought of quarantine in other respects, there can be no question that if quarantine were entirely abolished the world would be free of many most serious, annoying, and vexatious hindrances with which it now surrounds both travel and commerce.

The *second* mode directed to prevent the spread of epidemic disease to which I shall refer is known as medical inspection. In this system there is no attempt to prevent vessels landing their passengers and cargo, but when epidemic disease threatens, vessels coming from countries where such disease exists are inspected, and if any of the passengers or crew are found to be suffering from symptoms of this disease they are isolated and removed to hospital for treatment. This is the system which has been adopted in England, and it has been found to work well. It involves no vexatious interference, and provides both care and comfort to the sick, which must be most beneficial for them. In this respect it is an excellent system, but there is no evidence to show that the comparative exemption from epidemic disease which England has enjoyed can be properly attributed to it. Quarantine is a much more stringent system than medical inspection. If disease can be kept out of any country by police arrangements, then quarantine is much more likely to effect this object than medical inspection. But, as we have already said, quarantine has signally failed, and it therefore cannot be argued that the less stringent method of medical inspection has proved successful. The comparative exemption which England has enjoyed seems in the main to have been due to another and totally different cause. This exemption is all the more remarkable when we remember the enormous direct traffic, both of passengers and goods, which is carried on between English ports and India, and that a large part of this traffic is with that very delta of

the Ganges which is believed by so many to be the source of all the cholera in the world. England, which has by far the largest and most constant communication with this so-called home of cholera is singularly free from the disease. For five-and-twenty years it has enjoyed a most remarkable immunity from it, although during that time many other countries in Europe, as we have already seen, have suffered, and some of them suffered severely.

And this brings us to consider the *third* and best mode of preventing the spread of epidemic disease, the only one in fact on which any reliance can be placed. I mean sanitary improvements—pure air, pure water, good drainage, proper food and clothing, with suitable dwellings, and the many other requisites of good health which might be arranged under these great heads. These are the best and only safeguards against epidemics, be it of cholera or any other disease, and not only against epidemic disease, which comes only at intervals, but also against the ever present though less alarming ailments which make up the annual death-rate. That such improvements have largely reduced the mortality from cholera there is incontestable evidence. The believer in human intercourse and specific contagium will say, "Yes, I grant all "this, but the explanation is that in a good system of water-supply the "specific poison is kept out of the water, and by good drainage and "conservancy it is carried off and not allowed to lodge in the soil, and "this is the reason why cholera is prevented." To this I would reply that I have advanced no theory of cholera causation. I base the recommendation of sanitary improvements purely on practical experience. I would say to everyone who has a theory as to the cause of cholera or any other disease—Experience has proved beyond all doubt the benefit of sanitary improvements. You are welcome to adopt any theory you please as to the manner in which these improvements act in preventing disease. The great point on which all are agreed is that they do exercise the most beneficial effect in this respect. Let us unite, therefore, in urging the necessity for such improvements. What is wanted is practical work, the theory on which it is based is a matter of very minor importance.

I have spoken of the great evils of quarantine, but there is one of these evils which I have not yet mentioned and which is the greatest of them all, and it is this—that quarantine tends to the utter neglect of these sanitary improvements. If people believe that they can keep out the disease-producing cause, and that if they succeed in this they are perfectly safe, what inducement is there to carry out such improvements? The call is rather to impose greater stringency in their quarantine arrangements. If these failed before, it must have been because they were not sufficiently strict; and so the ports are guarded more rigidly than before, and travellers and commerce are subjected to even more vexatious and annoying regulations than ever. But the result is the same—disastrous failure. Quarantine thus not only promises a protection it cannot afford, but it diverts attention from the only real protection that can be provided. Time and money and people's patience are wasted, and all to no purpose, the real evils to be grappled with are left untouched.

I commenced with a remark on the terms "epidemic," "sporadic," and "endemic," and I shall close with this other remark, that far too much importance is attached to these terms. They are often employed as if they meant something really definite, and as if the determining of them in each particular case added to our knowledge of the disease concerned. I remember well the frequent inquiries which the Constantinople Board of Health used to make of the Government of India as to whether cholera at some particular place was "endemic," or "epidemic," or "sporadic," because they believed that their quarantine regulations could not be properly framed without this information, and how they sometimes complained afterwards because they thought that one of these terms had been used when another ought to have been employed. Often have I felt inclined to point out to them how much better it would be if they ceased to trouble themselves about our state in India, and concerned themselves with the state of their own countries, and more especially with the drainage and water-supply of their towns, which in many quarantine lands are so neglected. And to every country, and more particularly to those which still believe in quarantine, I would say the same thing. Look to your own state, for in sanitary improvements you have the best and only safeguard against cholera and other epidemics, and not only against them, but against all the other diseases which are more or less always with you. And in carrying out these sanitary improvements you will have the further satisfaction of knowing that they involve no interference with personal liberty, no restriction on trade or travel—not one, in fact, of the serious evils and innumerable vexatious annoyances which are the necessary accompaniments of quarantine; but that, on the other hand, they will contribute greatly, not only to the health, but also to the convenience and comfort of the people.

Notes on the Transmission of Cholera from one Country to another.

BY

Robert Lawson, LL.D., Q.H.P., Inspector General of Hospitals.

It is generally recognised that cholera presents itself in two distinct forms, viz., that of simple or summer cholera, or cholera nostras, in which, with cramps and vomiting, and diarrhœa, the evacuations remain bilious, there is but rarely collapse, and the mortality is but small; and that in which the evacuations become like rice water, the urine is suppressed, collapse often profound, and the mortality always great; this is usually called Asiatic, or Indian, or epidemic cholera, but which, as avoiding any hypothesis, had better be denominated malignant cholera.

Cholera nostras is usually attributed to warm weather, the use of unripe fruit, and such like, and is not believed to have any connexion with previous cases, or to have any disposition to spread.

Malignant cholera, on the other hand, is supposed by many to be derived from previous cases, and always to have a disposition to extend to those who come into close communication with persons labouring under it; but, since the first appearance of the epidemic disease in Europe in 1832, there has been from time to time a considerable increase of attacks from the so-called cholera nostras, and among them no inconsiderable number of instances in which the disease presented all the symptoms of the malignant form so charaeteristically, that, if they had occurred in the middle of an epidemic, they would have been received without hesitation as well-marked cases of the prevailing disease, but because these could not be affiliated to a previous one, or were not followed by an extension to other persons in the vicinity, their identity with malignant cholera was denied, and they were regarded as cholera nostras only, and of no importance in this inquiry.

On the other hand, a person who may have come from a point where malignant cholera was prevailing to another where it may not yet have appeared, if eholera do spring up among those around him in the new locality, he is considered as having introduced the disease, especially if he have had diarrhœa in the interval, or even when he has not had that at all. These two contradictory propositions are found necessary to enable the theory of personal communication to embraee the facts. There are now, however, no inconsiderable number of instances of well-marked epidemics having sprung up in limited localities at a long distance from where the disease was already prevailing, and among persons who had not been absent from the locality for months, without its having been possible for them to have had personal communication either direct or indirect, with any one already affected. Those who advocate the diffusion of cholera by man have a ready method of dealing with what they consider such anomalies of evidence, they designate all occurences that support their theory as positive facts and worthy of the highest confidence, while all sueh as may be opposed to their opinion they describe as negative faets, and as entitled to no consideration whatever; but investigation into obscure operations of nature are not to be elucidated by this mode of dealing with evidence, and the sooner the medical profession condemns it the sooner are they likely to open up another leading to more precise and abiding results.

Among the instances which have occurred of late years of the outbreak of malignant eholera at points in advance of those the disease had already reached in the epidemie form, three may be particularised, as having been carefully examined into by most able investigators, viz., those at Southampton in 1856 by Dr. Parkes, and at Theydon Bois, in Essex, the same year, by Mr. Redeliffe; that at New Orleans in 1873, by the Board of Health there; and that at Toulon and Marseilles, in 1884, by M. Fauvel, Drs. Brouardel and Proust, and others from Paris and at Toulon. In none of these was there any trace of communication by siek or fomites deteeted.

In the summer of 1865, it will be remembered that the whole of the northern coast of the Mediterranean was invaded by cholera, and this advanced northward gradually, reaching Paris in the end of

September only, though there were well-marked indications of its approach at many points to the north of Paris even months earlier.

Thus there was a fatal case in the "Boro'" (London) on 28th June, with all the characters of malignant cholera, and another, which recovered in Guy's Hospital in the beginning of July. There was a case of the same description at Southampton on 12th August, and through England and Scotland, and even in Denmark and south of Sweeden, cholera nostras was unusually frequent during the summer and early autumn, and with many more cases of the malignant form than in ordinary years.

At Southampton the outbreak commenced with a man named Rose, who resided in Brew House Court, five furlongs west of the railway station, who was seized on 22nd September, and died on 24th; the next case was in a lad named Hill, who resided with his family at Weston Common, two miles from Southampton, who was attacked on 23rd September, his father and sister following on 26th. On 27th a man named Staveley and his son were attacked at Bitterne, a village two miles from Southampton in a different direction. On the 28th there was another attack of cholera in Southampton itself, and the disease went on from this date to 4th November, when, including all the localities named, there had been 60 persons attacked.

In the Theydon Bois case, Mr. Groombridge and his wife had been at Weymouth and Portland for change in September. After exposure to a cold wind on 23rd, Mr. Groombridge had severe griping and diarrhœa on 24th, and he and his wife returned home on 25th, by rail, to Southampton and London, but neither left the train or station. On 26th Mrs. Groombridge had diarrhœa, sickness and cramp followed on 28th, collapse on 29th; reaction commenced on 30th, fever succeeded, and she died on 11th October. On September 30th a daughter, aged eight, was seized with cholera, and died the same night, and in the next week six other persons connected with the family contracted the disease (including Mr. Groombridge himself on 6th), and some others followed. It was subsequently found that the soil pipe from the water-closet leaked into the well from which the water for the household use was obtained. From the appearance of the spot this had been going on for a considerable period. As neither Mrs. Groombridge nor her husband had been exposed to any previous case, it is clear that had the contamination of the well water been the cause of her attack that must have been produced by some other factor than choleraic evacuations, which could have nad no access to the well until after she herself was attacked. That the local conditions around Theydon Bois were unusual at this time, however, is indicated by the fact that several cases of cholera nostras occurred in the neighbouring districts of Epping, Harlow, and Mitchingham, quite unconnected with the Groombridge family.

So much for the occurrences which precede an epidemic of cholera in full force, and which the late Dr. Bryden proposed to name the aura of the epidemic. In this instance the epidemic soon followed, for in 1866 England, the east coast of Scotland, northern France, Belgium, Holland,

and all the country up to the shore of the Baltic came under it during the summer.

Its influence was also experienced half-way across the Atlantic early in the year, as the following facts show distinctly.

The steamship "England" sailed from Liverpool on 28th March, with 37 cabin and 1,059 steerage passengers, Germans from East Friesland. Cholera appeared among the latter 3rd April. She put into Halifax on 9th, having had 150 attacks, with 46 deaths in the interval. The people were landed, and from this time the attacks diminished, the last being a mild one on 30th April. The greatest mortality was in the night, 10-11 April, when 40 deaths occurred. It was estimated that there had been from 500 to 600 cases of developed cholera, and that from 200 to 300 had died, one steward, two sailors, and three firemen died, but none of the cabin passengers were affected.

The steamship "Virginian" left Liverpool with emigrants on 4th May. On 12th three of them died of cholera, eight more on 13th, and seven on 14th. On 22nd, when the passengers were removed to the "Falcon" quarantine vessel at New York, the deaths had amounted to 50.

The steamship "Union" left Liverpool on 12th May with 434 passengers, 231 of them foreigners. On 18th May cholera appeared in a Dane, and 33 died of it during the passage to New York, where she arrived about 30th, with 34 more under the disease, many of them moribund.

The steamship "Peruvian" left Liverpool for New York about same date as the "Union" with 758 passengers, and seems to have arrived there about the same time; 35 deaths had occurred from cholera during the passage, and 28 were affected by it on arrival.

The steamship "Helvetia" sailed from Liverpool on 2nd May with 801 passengers, but in her the disease broke out before she reached Queenstown, and she put back.

The "England," Virginia," and "Union" were all very close to the same point in the Atlantic when cholera appeared in them, viz., lat. 48° 50′ N., and long. 28° 40′ W., and the "Peruvian," being a steamer also and saling about the same time as the "Union" must have passed over nearly the same track as she did, and consequently in the vicinity of the same locality where the others contracted the disease.

The outbreak of cholera at New Orleans, and in 1873, was the commencement of the epidemic which overspread the valleys of the Mississippi, Ohio, and Missouri in the course of the summer of that year, but which nowhere reached the Atlantic coast, was of the same description as to origin as the epidemic at Southampton in 1865. The first cases occurred in persons who had been in the country for long periods. Up to the beginning of April, 31 had been met with of which two only recovered. In very few instances had any of these had communication with those immediately preceding. The members of the Board of Health, after inquiring into every circumstance connected

with the earliest and subsequent attacks, came to the conclusion that no vessel had arrived recently in which cholera had existed, and that it was attributable to faetors acting locally, and had not been imported.

In 1883 cholera appeared in Egypt and, as was expected, extended into the Mediterranean the following year, where it broke out at Toulon. The first case appeared on 14th June, 1884, in a seamen on board the "Montebello," a line of battle ship, lying in the Southern Division of the Harbour at Toulon, and the following day another who was quartered in the same part of the ship was attacked. Neither of those men had been at sea for many months, the former died in eight days of consecutive fever, and the latter in eighteen hours of Algide cholera. On the 21st a case occurred in the Lycée, an establishment in the centre of the town, and a long way from where the "Montebello" lay, this case proved fatal in six hours. The population were dismayed, and the students at the Lycée were dispersed immediately. On the 22nd there were nine deaths from cholera, and from this the disease increased, though but slowly at first, and it gradually extended through the southern districts of France.

The three instances given above show that the efficient cause of the epidemic of malignant cholera can be conveyed to localities a great distance from where it is already prevailing, in sufficient quantity to generate an epidemic, without being carried by man or fomites.

In other instances persons coming from a locality where cholera was present, and with the disease either active or incubating, have arrived in a new one where it was impending, or where some sporadic cases may have actually occurred. Under such circumstances the latter are usually put aside as merely cholera nostras, and hence of no significance, and it is forthwith assumed that the fresh arrivals imported the germs of the disease and originated the epidemic which followed.

Before this inference can be established, however, it is clearly necessary that the possibility of the epidemic having arisen altogether independent of the arrival of the sick must be excluded, which the evidence usually presented does not permit of being done. The only other supposition compatible with the facts is that it is conveyed by currents in the atmosphere, not necessarily those experienced on the earth's surface, but by others at some elevation, often moving in the contrary direction. The experience of ships at sea has now accumulated sufficiently to show that the efficient factor is air-borne, and active there as well as on land, whenever it meets with the necessary conditions to develope it.

Ships present cholera very differently under different circumstances; some leaving a place where it is prevailing, may have an outbreak immediately, which disappears within the incubation period, and the remainder of the voyage passes without any further trace of it; others are attacked after they are at sea beyond the incubation period, but the outbreak terminates in a few days as in the previous category; in others again, the disease instead of diminishing increases in frequency, and generally also in severity, and there may be a terrible epidemic,

as in the case of the "England," lasting to the end of the voyage. Ships with cholera present much the same combination as those with yellow fever as regards the two diseases; any number of yellow fever cases may be put on board a healthy vessel, and they will run their course without extending to anyone on board, but if she have the peculiar condition of bilge which causes yellow fever, everyone on board, or who may visit her, who may be exposed to the emanations from it will be liable to contract the disease; similarly, if a ship have merely an outbreak of cholera on sailing, or a limited one, as noticed above, some time after sailing, no further trouble is likely to ensue, but if there be deficient ventilation, bad food and water, and a want of personal cleanliness among the passengers, and especially if there have been bad weather, and the least inattention to the removal of the evacuations, both of the sick and those in health, a focus of the disease is rapidly generated, as was the case in the "England," and to a lesser extent in many of the vessels carrying emigrants or coolies. For this reason the earliest opportunity should always be taken to remove every person from a vessel with a focus of cholera on board, until she can be thoroughly disinfected and cleaned.

The chief factor of cholera being thus carried by atmospheric currents, cannot be excluded from any country, and, where it has been distributed over any area, it excites the disease directly in many persons who are predisposed to it, and forms foci of it whenever it finds localities suitable for its increase; these are often very limited in extent, not embracing more than a single house, or even a portion of a house, or ship; the mortality among the steerage passengers in the latter is often very great, while the cabin passengers and all the crew have scarcely a case. Such foci are always badly ventilated and the emanations arising in them acquire much greater density than in the open air; as a natural consequence the clothing of those who reside in them absorbs an amount of the emanation sufficient to produce cholera in susceptible persons outside until it has been dissipated by exposure; those so affected, however, and the others who have contracted the complaint apart from such foci, do not seem to have any such influence, it being not the body but the emanations from the locality which generate the disease.

Cholera, therefore, cannot be excluded from any country by general quarantine. All that can be done is by hygienic measures to improve the health of the population, and to remove the conditions which favour the formation of foci.

The placing ships which arrive with cholera on board under observation, removing their crews and passengers to suitable localities on shore until the disease ceases among them, are very proper precautions and may prevent a small amount of the disease among the surrounding population, but can never prevent an epidemic if the necessary factors be in progress.

Australasian Maritime Quarantine, its Theory and Practice.

BY

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*** The amount of traffic to be dealt with is an important consideration in all questions of practical quarantine. The following comparative statement is therefore quoted:—"It will be observed that in "absolute tonnage Sydney was surpassed by five English ports— "London, Liverpool, Cardiff, Newcastle, and Hull; though in point of "value the trade of Sydney exceeded that of any port in Great Britain, "London, Liverpool, and Hull excepted."—The Wealth and Progress of New South Wales (annual volume for) 1890, by T. A. Coghlan, Assoc. M. Inst., C.E., Government Statist. Sydney: Charles Potter, Government Printer.

Before proceeding to read the account of Australasian quarantine which I have been invited to contribute to the proceedings of this Congress, I wish to make it clear that the principles to be described have been adopted by each of the independent Governments of the six Territories. A former chief of the Executive Government of New South Wales (the late Sir Alexander Stuart, K.C.M.G., M.L.A.) summoned the Australasian Sanitary Conference of Sydney, N.S.W., 1884, at instance of his chief medical officer (the Hon. Chas. Kinnaird Mackellar, M.B., M.L.C.). It was attended by the chief medical officers of the other five Governments; I was myself nominated a special delegate for New South Wales, and subsequently chosen Secretary; and the proceedings were opened by the Minister then at the Treasury (the Hon. G. R. Dibbs, M.L.A.), in whose department matters of quarantine are transacted. The gentlemen referred to had for years been engaged in executing the quarantine law in their respective territories, and the objects sought of them were a declaration of the principles by which the several Governments were guided in administering it, and an agreement in a line of quarantine practice which should be uniform in its important features all over Australasia. In those objects the Conference was successful. After slight discussion of some points, a series of formal statements or resolutions was adopted with absolute unanimity; it was embodied in a parliamentary paper, which was accepted by each Government at the hands of its proper delegate, and it was subsequently communicated to each parliament in the usual way. Nothing has been done since to alter or to modify the conclusions then accepted; and therefore, when I describe them I must be taken to describe the theory of quarantine as it is received in Australasia at the present day.

Experience has shown me that it is desirable to define the sense in which two or three necessary terms are used. "Quarantine" is a word

that of old meant the unconditional arrest and detention of all vessels that arrived from any port infected, or believed to be infected, until the presence or absence of disease from them was proved by lapse of time; when I use it in that old sense I am in the habit of qualifying it as "ancient quarantine." But the same word is at present colloquially employed to designate any measure taken at ports of entry to arrest sea-borne contagion; and when I use it in this convenient sense I shall speak of "quarantine" without qualification. Next, the term "medical inspection" has never borne more than one meaning, and I need not stop here to explain that. Then, when I have to speak of the more modern plan which is neither ancient quarantine on the one hand nor yet medical inspection on the other, I use the phrase "limited quarantine"; and by limited quarantine I mean:—The examination conducted to ascertain the presence or absence of causes of communicable disease, without detention for more time than is necessary to the discovery and the destruction or removal of such causes.*

The main discussion touching quarantine now revolves about the use of medical inspection. This practice is strenuously advocated by English sanitarians; but, notwithstanding the great weight their opinions justly carry, it is not exclusively followed in any other part of the world; and it is worthy of especial note that it is not exclusively (if at all) followed in any of the Crown colonies, although they are ruled by agents of the English Government, who act under instructions directly transmitted to them from England. The reason is this: All measures of quarantine must be carefully adapted to local circumstances, if they are to profit the people that seek protection from them; and those circumstances are usually different in different countries. What was the origin of medical inspection in England? When the first inquiry into quarantine was made by the General Board of Health, nearly fifty years ago, it was found that England had but few stations remaining, and those devoid of every accommodation and of every appliance that such stations should have. No measure of quarantine could be carried out with the establishments then discovered; yet some measure was felt necessary. At last the Board issued the report† in which ancient quarantine was condemned, and the plan now generally known as medical inspection recommended. There is much in it of great value; many suggestions that were new fifty years ago, and many facts of enduring interest. But, notwithstanding the distinguished names that are attached to it, I cannot profess to have been much impressed by that document at any time in regard of the question with which I am more immediately concerned; it is, in fact, a very ably conceived piece of

* The National Board of Health of the United States called such measures "rational quarantine"; and defined this to be "The organisation employed to "determine the absence or presence of the causes of infectious disease; and it does "not imply detention for any specified time, nor for more time than is necessary for "the above purposes."

† Report on Quarantine, with Appendices.—General Board of Health, London, 1849.

special pleading. It starts from a false premiss, and gets its seeming force by subreption. But, however, all I wish to point out now is this: The board declined to discuss the question of quarantine in relation to the local conditions—they chose a higher line of argument; and yet, as it turns out, the scheme of medical inspection which they advocated is as nicely adapted to those local conditions as though they had received full consideration—all that consideration without which no practically useful plan of quarantine can be framed. Those conditions must then have been very much what they are to-day. Physically, Great Britain is an island; but regarded epidemiologically she is a part of the continent of Europe. Her sea-belt, a real defence in time of war, is of little more significance in times of plague than a geographical frontier-line drawn upon a map. Secondly, she greatly fears the importation of but one disease—and that one cholera, which cannot be prevented from spreading between contiguous countries by any measure of quarantine, as experience has again and again demonstrated; all other diseases of which her climate allows, and which other nations fear, are already established within her bounds—familiar household enemies; and besides, if detention for any other disease were thought desirable, yet it could never be done, because of the unmanageable numbers of persons that would soon accumulate at quarantine stations. Thirdly, she has an internal sanitary service of great and daily-increasing efficiency. These are the chief points in England's local conditions; and her quarantine practice of medical inspection is not merely admirably suited to them, but by the very exactitude with which it fits them, is shown to be the only course of action possible to her. For precisely the same reason it may not be the best practice in countries which differ from England in almost every local condition, and especially in accessibility and amount of international ocean and land traffic. This view is too little regarded by English sanitarians, in my opinion, when they turn their attention to other countries. The following proposition may be judged to warrant the suggestion that other nations may sometimes profitably lean rather towards the pole of ancient quarantine than towards the antipodes of medical inspection, namely: *the degree of protection which quarantine measures* CAN *afford is inversely as the ease of communication* between the infected country and the country to be defended.*

The Australasian Conference, to which I alluded at first, was swayed by such considerations as I have now recapitulated in formulating their views of quarantine measures in general, and of the modification known as medical inspection in particular. They reflected that the conditions to be met in Australasia differ from England's—(1) as to the kinds of exotic disease so far not introduced, but likely to establish themselves if once they were introduced; (2) as to the kinds of disease already locally endemic or familiar; (3) as to perfection of internal sanitary organisation; and (4) as to conditions of traffic. But, almost as

* In the course of discussion, it became necessary to point out that "ease of "communication" and "amount of traffic" are distinct conditions of importance in this connexion for very different practical reasons.

a preliminary, they began by rejecting ancient quarantine. They declared that "a ship infected with small-pox is one which has borne a case "of small pox during the voyage"; and that definition, extended to meet other diseases such as cholera or yellow fever, by itself excluded ancient quarantine once and for all. Neither were any relics of ancient quarantine retained; we do not, on the one hand, enforce our quarantine with shot-guns, as is the case in the neighbouring Crown colony of Fiji; nor, on the other, do we order ships to stand off, and refuse to relieve them of their stricken passengers or of their local infectivity, as has happened within my experience in two Crown colonies of England and in one colony of the French Republic. Having thus formally declined the inhumane practices as ancient quarantine, they proceeded to clear the ground to be traversed in the following way: First, they declared that all quarantine should be relinquished as between the six Territories, and that Australasia should be regarded as constituting but one epidemiological tract, because of the constant and great movement of the population which is fostered by cheap and daily services of steamships and rail-roads. And then, secondly, by way of setting their own house in order before proceeding to restrictive measures which would affect other people, they addressed themselves to the matters of local and personal susceptibility. They declared that *quarantine can yield a protection commensurate with its cost only to countries whose internal sanitation is good.* I desire to fix attention on that proposition because Australasia's chief use for quarantine at present is against small-pox, and it may be remarked justly that vaccination is the proper defence against that disease. In order to enforce it, I need merely repeat another proposition enunciated by them, namely : *The function of quarantine is not to exclude infection, but to lessen the entering number of foci of infection.* The defects inherent in all quarantine measures are there acknowledged in a way to make it clear that we do not rely upon any of the latter as an all-sufficient defence against imported disease; and the necessity of removing the conditions of local and personal susceptibilities is there recognised by implication, just as in the former proposition it was directly declared. I need not detain you, therefore, with a description of the great attention devoted by the Conference to the special subject of vaccination, nor with an account of the efforts almost constantly made by every board of health to render vaccination laws more efficient, or to procure the enactment of new ones; neither need I do more than advert to the very costly works of water supply and sewerage completed or in course of daily extension, and to the elaborate codes of sanitary law which have been enacted in most of the six Territories, in order to prove that those propositions are of more than academic force.

Thus far I have described principles which were recognised by the Conference as forbidding them to take certain steps. They proceeded next to decide what they would do. As they had begun by unconditionally rejecting ancient quarantine, so now they rejected medical inspection as involving a principle of action not always suited to the local circumstances. In this course they were guided by considerations which may be expressed

in this aphorism : *Nations whose internal sanitary organisation is not perfect, cannot afford to refer the observation of suspects to the country at large.* They decided therefore, that when the imported disease was one till then unknown, or at all events unfamiliar on shore—as, for instance, when it was cholera, or small pox, or if it were yellow fever,—limited quarantine should be used; that is, that (1*a*) ships which had carried a case during the voyage should be detained; (1*b*) that all on board should be landed, together with their effects; (1*c*) that the ship and her equipment should be forthwith cleansed and disinfected by the disinfection staff, and (1*d*) at the earliest possible date handed over to the owners, who might take her out of quarantine with a fresh crew procured from the shore; that (2*a*) the effects of the ship's company at the quarantine station should be forthwith disinfected and washed; that (2*b*) the sick should be transferred to a hospital ship; (2*c*) the suspected to an isolated hospital of observation; and that (2*d*) the apparently well should suffer a period of detention somewhat longer than the recognised clinical incubation period in (2*e*) one or other of several enclosures remote from the sick and suspected. But, although medical inspection was thus rejected as a principle of action, it was not rejected either in ignorance or haste, or in a spirit of opposition or prejudice. And therefore when the case of some other diseases came to be considered, it was readily perceived that the local conditions then resembled those of England, and that therefore the English practice (not might, but) must be adopted. Accordingly, it was decided that when a vessel arrived infected with scarlatina, or diphtheria, or the like disease already familiar ashore, then medical inspection in its classical form should be used. Accordingly in such cases, which are but too often met with, we (a) remove the sick not to quarantine but to an ordinary isolation hospital—(b) cleanse their quarters, and (c) allow the vessel to proceed to the quays and discharge passengers and cargo in the usual way, after a detention which never lasts beyond five or six hours. In such cases we also do rely upon the internal sanitary organisation to detect any illness which may subsequently develop among the general population—an organisation which, although imperfect, is very much in advance of what (probably) is generally supposed. Those are the leading principles of Australasian quarantine, by which the Government of New South Wales has been very strictly guided since 1884; and if it should be the case that those same approved principles have not been as closely adhered to by the other five Governments, I believe the reason must be sought in circumstances rather of a political than a commercial or scientific character.*

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* The Hon. Dr. Mackellar (N.S.W.) made the useful suggestion that the quarantine stations should be established at remote points of the continent first approached by inward-bound vessels; these could then have pursued the voyage in quarantine, and several days detention would have been saved to passengers at terminal ports. It was accepted by the Conference, but was never carried into practice.

The limit of time necessarily imposed prevents me from saying much as to details of practice in New South Wales. However, I may mention that Sydney (to speak of that city alone) is the terminal port for all passenger lines which trade to Australasia; that the quarantine station there has an area of nearly 1,000 acres, is bounded by water on three sides, and is eight miles distant from the city; that a permanent staff, which is expansible at brief notice from a reserve of tried men, nurses, and laundresses, is maintained under a superintendent who has statutory duties; that there are very extensive buildings of stone, brick, and wood; that there are two of Lyons' steam disinfectors, a steam laundry, a hospital ship of 32 beds, and a shore hospital of 60 or 70 beds distributed among four separate buildings; and that during quarantine medical attendants are specially engaged to reside on the ground, who are subject to the quarantine law. This establishment is in constant communication with the offices of the Board of Health by electric telegraph and telephone; it falls to me, as executive officer of the Board, to visit the station from time to time, to supervise steps of importance, and finally to report upon the circumstances, both from day to day and at last in summary, for the information of the Board.* But the proof of efficiency must be sought in the result of practice; I therefore add, to illustrate one important point, that we have cleansed ships, with their effects and passengers' luggage, arriving unexpectedly and carring 600 persons, within 48 hours; and to illustrate another important point, that in 1887, when we had in quarantine 432 persons who had been exposed to the infection of small-pox, although no less than 79 of them subsequently developed that disease, not one fell ill more than eleven days after his removal from the infected ship.

DISCUSSION.

Dr. Jules Rochard (Paris) said:—La transmissibilité de la plupart des maladies épidémiques est aujourd'hui démontrée. Personne ne la conteste, lorsqu'il s'agit des maladies qu'on désigne, dans le langage sanitaire, sous le nom de pestilentielles, c'est-à-dire, *peste,* la *fièvre jaune* et le *choléra.* Ce sont les seules dont je m'occuperai dans cette note, parce que ce sont les seules qui réclament l'emploi de mesures internationales.

Les moyens dont nous disposons aujourd'hui, pour nous préserver des épidémiques exotiques sont de trois ordres: l'isolement, la désinfection et l'assainissement. On peut empêcher les fléaux de pénétrer dans un pays, en détruire les germes à leur entrée et lors même qu'ils y ont pénétré, enfin rendre le pays refractaire à leur propagation, en faisant disparaître les foyers d'infection dans lesquels ils s'implantent et se développent.

Des trois moyens le premier est le plus simple et le plus radical. C'est aussi le plus difficile à employer parce qu'il exige l'intervention du pouvoir

* The Board consists of the President (Dr. F. Norton Manning, Inspector-General of the Insane, Medical Adviser to the Government), the Under-Secretary for Finance and Trade, the Inspector-General of Police, and six non-official members, of whom four are medical practitioners.

publique, une entente internationale et une rigueur, une exactitude sans égale dans l'application des mesures dont l'ensemble constitue la *police sanitaire.* C'est le système des quarantaines, des lazarets et des cordons sanitaires. Celui-là a fait ses preuves, car il se monte au moyen âge et se présente le plus aîné.

Le second est d'application plus récente. Nous le devons aux progrès de la science contemporaine. Je compte à purifier les locaux, les objets et les vêtements : soit à l'aide de liquides antiseptiques, soit en les soumettant à une haute température, à l'aide des étuves à vapeur sous pression.

Le troisième repose sur les progrès de l'hygiène urbane, sur tous les moyens qui assurent la propreté rigoureuse de la voie publique, des habitations et des personnes. Celui-là représente l'avenir.

Il est probable en effet que, lorsque tous les desiderata de l'hygiène seront comblés, lorsque les grandes villes, par lesquelles penchent le plus souvent les maladies contagieuses seront assainies, on pourra braver les épidémiques et laisser circuler les contages qui ne pourront plus germer sur un terrain devenu refractaire ; mais d'une part, ce sont là des pré somptions, et bien des générations s'étendront avant de voir se réaliser ces espérances, avant qu'on ait rempli les conditions qui nous les font entrevoir ; d'une autre part tous les peuples ne sont pas en mesure de s'imposer les sacrifices qu'elles exigent.

Depuis la sévère leçon que l'Europe a reçue déjà un an, elle n'a rien fait pour prévenir le retour de pareilles catastrophes. Parmi les grandes. villes du littoral Méditerranien qui ont été ravagées à cette époque, Naples est la seule qui ait commencé ses travaux d'assainement.

L'Angleterre, disait à la Conférence internationale de Rome l'un de nos confrères le plus sympathique, l'Angleterre a dépensé cinq milliards pour s'assainer depuis le commencement du siècle, et c'est pour cela qu'elle ne craint plus le choléra. Cette sécurité vient aussi de son éloignement de la grande distance, que les navires venant des lieux contaminés ont à parvenir avant de débarquer dans les ports. Nous ne la félicitons pas moins d'avoir donné cette garantie à ses populations au prix des plus grands sacrifices, mais les autres nations de l'Europe n'ont pas encore pu l'imiter. Celles que touchent à la Méditerranée sont beaucoup plus rapprochées qu'elle des points d'où le fléau nous arrive, et il serait pour elles de la plus haute imprudence que de rompre d'une façon complète avec les vieux usements de la police sanitaire. Il faut les mitiger, les approprier aux temps où nous vivons, les mettre en rapport avec les enseignements de la science contemporaine, mais il ne faut pas les abandonner d'une manière absolue.

Cette grave question a été débattue avec tous les développements qu'elle comporte à la Conférence internationale qui fut ouverte à Rome le 20 mai 1885, et dont un grand numbre de membres siègent aujourd'hui dans ce Congrès. Les délégués français ont été assez heureux pour faire triompher leurs idées et les conclusions de la Conférence ont été conformes à leurs propositions.

Ces conclusions, vous me permettrez de vous les rappeler, réduisaient lesquarantaines maritimes aux proportions rigoureusement indispensables ; elles proclaimaient l'inutilité complète des cordons sanitaires, des quaraintaines de terre et remplaçaient celles-ci par de mesures de surveillance et de désinfection prises aux gares frontières ; elles substituaient autant que possible l'assainissement des navires au départ et pendant les traversées, à la séquestration et à l'interrement des passagers dans les

lazarets, mais elles maintenaient une surveillance rigoureuse dans la Mer Rouge pour les navires venant de l'Inde, des dispositions spéciales en vue du pélerinage de la Mecque et continuaient à infliger la quarantine aux bâtiments qui avaient le choléra à leur bord.

Ces conclusions votées par la Commission technique n'ont pas reçu de sanction officielle. La Conférence qui devait se réunir au mois de Novembre 1889 pour leur donner son approbation, n'a pas été convoquée et les choses, au point de vue diplomatique, sont restées dans le même état. Mais les propositions votées par une réunion d'hygiénistes de tous les pays choisis par leurs gouvernements, n'on a pas moins eu une autorité morale considérable et la plupart d'entre elles ont été appliquées depuis.

Les mesures de désinfection ont été adoptées à bord des navires français ; on les a prises au point de départ des pays suspects, pendant la traversée et au port d'arrivée lorsque le cas l'exigeait.

Lors de l'épidémie de choléra qui a récemment ravagé l'Espagne des postes sanitaires dirigés par des médecins français ont été établis dans les gares frontières ; une inspection sévère y a été exercée et la désinfection des objets contaminés ou suspects a été effectuée à l'aide de bains à vapeur sous pression. Enfin les voyageurs venant des provinces où règnait le choléra ont été soumis à une surveillance de cinq jours dans les villes où ils se sont rendus. Il y a lieu de penser que c'était à l'emploi de ces mesures que nous devons d'avoir été préservés du choléra qui a pendant si longtemps règné à nos portes.

Enfin, le consul sanitaire maritime d'Egypte applique en ce moment les mesures proposées par la Conférence internationale de Rome, pour préserver l'Egypte et l'Europe de l'invasion de choléra qui règne en Arabie et en Syrie.

Je crois donc qu'il faut persévérer dans l'emploi des mesures qui répondent aussi bien que possible aux nécessités du moment et aux connaissances que nous possédons, tout en reservant les droits imprescriptibles de l'avenir.

Dr. Felkin (Edinburgh), wished to say a few words about preventive medicine in Central Africa. The natives there recognise the need of preventive medicine. First, with regard to syphilis the native knows that the Arabs bring the disease and take precautions against its spread, the Baris going so far as to inoculate, and no boy or girl is allowed to marry till inoculated. Small-pox is isolated, and cases are only nursed by those who are "pitted" already. After four epidemics of cholera imported from the East, the natives burnt a large district to prevent its spread. In conclusion, Dr. Felkin said that in many ways we might take lessons from the natives.

Le Lazaret de Camaran "Mer Rouge," et le Choléra asiatique.

PAR

le Dr. C. Stékoulis, Constantinople.

Il y a huit ans, nous avons publié un rélévé des seize* épidémies cholériques qui, de 1831 à 1883, dans une période de quarante-deux

* Le Pélerinage de la Mecque et le Choléra au Hedjaz.– Constantinople, 1883.

années, ont sévi dans la province du Hedjaz. Nous y faisions ressortir que les épidémies de choléra asiatique observées à la Mecque durant le pélerinage, ont toutes pour origine, plus que probable, l'importation par la voie de mer. Une seule de ces seize épidémies—celle de l'année 1872—pourrait présenter des doutes quant à son importation, étant donné qu'on suppose qu'elle a pénétré au Hedjaz par la voie du désert et du Djebel-Chamar, et encore n'en a-t-on pas de preuves sérieuses à l'appui. De plus, l'épidémie de l'année dernière qui, du 26 Juillet au 17 Septembre, a sévi à la Mecque, à Médine et dans les ports du Hedjaz, est venue confirmer l'opinion reçue que le choléra indien pénètre dans cette partie de l'Arabie par la voie maritime.

Se basant sur ce fait constaté depuis près d'un demi-siècle, l'Empire ottoman a pris des précautions, et a préconisé dans la Mer Rouge des mesures prophylactiques, ayant pour but de soumettre à l'observation sanitaire les pélerins, arrivant des contrées baignées par l'Océan Indien.

Quoiqu'un peu tard, mais après de longues études entreprises à la suite de la Conférence sanitaire internationale de Constantinople en 1866, la Turquie a choisi en l'année 1882 l'île de Camaran, située à l'entrée de la mer Rouge, comme le lieu propice pour l'établissement d'un grand lazaret. Ce choix était heureux, car l'île se trouve à proximité du détroit de Bab-el-Mandeb : elle est vaste, elle est relativement saine pour ces parages du Golfe arabique, elle est enfin pourvue d'eau et d'un mouillage sûr.

Malheureusement, l'expérience a demontré que les deux fois où, le choléra s'est manifesté parmi les pélerins en quarantaine à Camaran, il a sévi aussi dans la province du Hedjax. Cela est arrivé en 1882, quand *l'Hesperia*, venant de Bombay, a infecté le lazaret de Camaran : cela est également arrivé l'année dernière, quand le *Deccan*, venant de Bombay, lui-aussi, à apporté le choléra dans le même lazaret.

Ajoutons l'épidémie qui sévit actuellement au Hedjaz. Cette année encore le lazaret de Camaran a été infesté par le choléra, importé par le vapeur *Sculptor*.

Etudions les causes de cette coïncidence.

Avant d'examiner de quelle façon fonctionne réellement le lazaret de Camaran, hâtons-nous de dire que cet établissement quarantenaire est destiné à abriter en même temps un nombre considérable de pélerins. Les *Hadjis* arrivent par groupes de 500 à 1,200 et plus même, et si plusieurs bateaux se présentent en rade à le fois, le nombre des quarantenaires se trouvant dans le lazaret peut monter à 3 et à 4,000. Pareil fait s'est présenté assez souvent; l'on peut même citer une année, où, à un moment donné là 4 à 5,000 pélerins purgeaint ensemble leur contumace.

Pendant chaque saison de 20 à 25,000 personnes arrivent dans le lazaret pour être soumises aux mesures sanitaires, chiffre énorme si l'on songe à tout ce qui doit être fait pour assainir cette masse d'êtres humains.

Les fidèles Musulmans, qui se rendent au pélerinage de la Mecque, arrivent de tous les coins du vieux monde. Ils se soumettent volontiers à toutes les privations, pourvu qu'ils arrivent au but de leur voyage. D'aucuns font par terre tout le chemin qu'ils ont à parcourir ; c'est pour

eux un voyage variant, suivant l'éloignement du point de départ, de quelques jours à plusieurs mois. D'autres arrivent au Hedjaz par mer, puis ils débarquent et se rendent à la Mecque par terre. Ce sont ces derniers qui viennent au lazaret de Camaran. Leurs provenances sont les pays de l'extrême Orient, et ils arrivent après des voyages de plusieurs semaines, de plusieurs mois même. Et quels voyages ! les malheureux *Hadjis* sont entassés dans les cales des navires mal aérées ; ils manquent d'espace et ne peuvent se mouvoir à leur aise ; la bonne eau potable fait défaut et souvent aussi ils n'ont même pas de nourriture saine à manger. De plus, et c'est là un point important, digne d'être noté, la plupart des pélerins quittent leur pays dans état marqué de misère physiologique, causé par des maladies ou par l'âge avancé; plusieurs même se rendent aux Villes Saintes de l'Islam, pour y finir leurs jours en terre bénite.

Les pélerins arrivent donc à Camaran exténués par des fatigues et des privations de toute espèce et portant sur eux toutes ces causes de maladies.

Aussitôt débarqués, les pélerins sont séparés par groupes de façon à ce que toute communication entre eux soit impossible.

Cela fait, on les installe dans les ariches, sorte de hangars recouverts de roseaux, puis leurs hardes et effets sont soumis à la désinfection. La nourriture leur est procurée par des fournisseurs et l'eau leur est fournie par le lazaret.

Les règlements sanitaires ottomans avisent à tous les moyens de pratique sanitaire, mais dans l'état actuel du lazaret de Camaran l'application en est forcement imparfaite, de sorte que l'on ne pourrait compter sérieusement sur leur efficacité.

En effet, puisque l'île offre un espace de 45 lieues, les emplacements, servant de lieu d'isolement des groupes de pélerins, sont trop rapprochés.

Les gardes de santé sont reçueillis sur place par centaines, ce qui ne garantit pas leurs communications avec leurs familles.

L'eau n'est pas bonne à boire puisqu'elle contient une bonne quantité de sel marin, en temps surtout de sécheresse. De plus, elle n'est pas canalisée, mais elle est transportée par charges, à dos d'ânes, ce qui fournit de grands dangers de contamination.

Les lieux d'aisance consistent en de fosses sises à proximité des habitations des pélerins, dont le contenu est vidé chaque jour à la mer.

A chaque départ d'un groupe de hadjis ayant occupé une division ou un campement, les lieux d'aisance de cette division, de ce campement sont comblés. Mais ce moyen est-il suffisant dans un terrain poreux ? Et n'est ce pas, du reste, une question épineuse de rendre inoffensives les déjections de tant de personnes entassées à la fois au même endroit ?

La désinfection ne se fait que par des moyens chimiques et encore de la façon la plus imperfaite, si l'on songe à la nature du pélerin, qui sent mauvais de loin et qui transporte avec lui une grande quantité d'effets, et parfois même sa nourriture de poisson sâlé ou d'autres comestibles.

A coté de ces inconvénients d'un ordre primordial, il y en a encore un autre : c'est la population des villages de l'île, qui, attirée par la gain, augmente d'année en année. Cette population qui, lors de l'établissement du lazaret n'était composée que de 2–300 personnes s'occupant principalement de la pêche de la nacre, a, depuis lors, atteint le chiffre de 1,500 âmes et plus peut-être.

Si donc on prend en considération tous ces inconvénients réunis, l'on ne pourra que convenir que le lazaret de Camaran, ne sert qu'à degourdir les pélerins de leur long voyage, à les assainir peut-être dans une certaine mesure ; mais il est loin de fournir, en cas de manifestation de choléra, les avantages prophylactiques, que chacun a le droit de réclamer d'un établissement quarantenaire. Aussi la coïncidence du choléra à Camaran et à la Mecque est facile d'expliquer.

Le conseil international de santé de Constantinople cherche à remédier à cet état de choses par les moyens dont il peut disposer. Mais le principal moyen nécessaire pour rendre le lazaret de Camaran propre à remplir son but sanitaire, c'est l'argent, et il en faut beaucoup.

La caisse de l'administration sanitaire de l'Empire Ottoman possède des fonds provenant du surplus des taxes sanitaires ; de plus, les lazarets ont des revenus provenant des quarantaines.

Les moyens existent par conséquent pour organiser les lazarets de Camaran de façon à répondre aux exigencies de la science et de l'humanité.

D'après les stipulations établies entre les Puissances et la Turquie, c'est à cette dernière, que revient l'obligation de tenir en bon état les lazarets Ottomans. Mais il semble injuste de faire peser sur le gouvernement de S.M. le Sultan toute cette charge quand il y a des excédants de revenus sanitaires qui ne servent qu'à grossir des fonds de réserve sans profit pour personne.

En examinant la question dans sa véritable portée, personne ne saurait contester la nécessité des établissements sanitaires bien conditionnés. Le lazaret de Camaran doit figurer au premier rang, car il est destiné à recevoir des gens pauvres venant directement des pays où le choléra est endémique. Il a, de plus, la mission non seulement de garantir le pélerinage de la Mecque de l'invasion du choléra, mais aussi de préserver les pays du Nil et le bassin de la Méditerranée de l'importation de ce fléau redoutable.

Si cet établissement pouvait être installé suivant les exigences de la science moderne, les états Méditerranéens n'auraient, peut-être, besoin de faire de grands frais pour se préserver contre l'importation maritime du choléra.

D'autre part, si la voie du Hedjazest ouverte, sans soumettre les masses humaines des hadjis aux règles sanitaires, le pélerinage de la Mecque sera la menace permanante de la propagation du choléra en Europe.

Le lazaret de Camaran, convenablement organisé, peut parer au danger.

L'Angleterre, où nous nous trouvons en ce moment, et qui nous fournit la plus gracieuse hospitalité, a rompu à juste titre avec les idées

quarantenaires surannées, puisque, à part les mesures sanitaires prises dans toutes ces villes avec une générosité que tout le monde admire, elle a établi dans ces nombreux ports des établissements perfectionnés, pour sequestrer et soigner les malades venant de dehors et portant les germes des maladies exotiques. Que la même chose soit faite dans les possessions Ottomanes de la mer Rouge, et alors la question des quarantaines, si justement exécrées par le monde civilisé, sera en grande partie écartée.

Pour arriver à ce but désirable, voici ce que j'ai l'honneur de proposer à l'appréciation du Congrès.

Prier le Gouvernment de S.M. Britannique :

1°. Demander au Gouvernement de la Sublime Porte d'inviter le Conseil International de Constantinople de s'occuper sans retard de l'organisation des lazarets en Turquie, à commencer par celui de Camaran.

2°. Prendre l'initiative auprès des états amis, afin que les moyens soient mis à la disposition du Conseil International de Constantinople pour la mise en état des lazarets ottomans. Les moyens seraient l'excédant des revenus sanitaires et le produit des taxes des lazarets.*

DISCUSSION.

Dr. Charles N. Hewitt, Secretary of the State Board of Health of Minnesota, said:—From the standpoint of an inland state, such as Minnesota is on the North American Continent, the measures needful for the successful prevention and control of infectious diseases of men, are:— 1. Efficient organisation and legal authority of State and local boards of health, having direct and obligatory mutual responsibility. 2. Seaboard sanitary authorities to be required to report promptly to inland State boards of health, the name of immigrant, date of exposure or of disease occurrence, with date of landing and local destination of each person exposed to or having infectious disease on incoming ships. 3. That the port sanitary authorities from which immigrants embark, should furnish to the ship's surgeon (or captain, if there be no surgeon) the record as to infectious disease of such immigrants, to be by him handed to the inspecting sanitary officers of the port of arrival, with certificate that the immigrant has been properly vaccinated

The first two conditions have been met so far as the United States and Minnesota are concerned. We look to this Congress to further the third needful condition as a matter of International Hygiene.

* Le Gouvernement anglais a bien voulu proposer, au mois d'Octobre de 1891, au Conseil international de Santé de Constantinople d'affecter les excédents des recettes quarantenaires du lazaret de Camaran aux améliorations à introduire dans ce lazaret. Le Conseil international de Santé de Constantinople a accepté avec reconnaissance la proposition du Gouvernement britannique.

Maritime Quarantine and Sanitation in relation to Cholera.

BY

W. J. Simpson, M.D., Health Officer, Calcutta.

India is credited with being the starting place of many European epidemics of cholera, and on that account any matters relating to maritime quarantine must necessarily have some connexion with that country. But, owing perhaps to the conditions of the ocean trade with India and the unique relation of the Indian inhabitants to those of other countries not being sufficiently brought into prominence, and accordingly misunderstood, it has been somewhat hastily assumed that there is great danger of transportation of cholera by sea from India to Europe. If this were true, it would furnish an argument against any benefits to be derived from quarantine restrictions, for it so happens that India itself imposes a quarantine far more rigid and consequently far more effectual than any that can ever be established by International Law. The conditions also affecting the trade of the East with that of Europe are of a very different character from those which exist between European countries one with another or between Europe and America, and so important and influential are these differences that they completely nullify conclusions which may be formed in regard to the movement of Indian cholera by sea towards Europe on observations made of its behaviour by sea in Europe or America.

For the proper consideration of this matter it is necessary to remember who are the people affected with epidemic cholera in Hindoostan. The population consists mostly of Hindoos, a large proportion of Mahomedans, a small number of Eurasians, and, if we except the British army, a mere sprinkling of Europeans, Armenians, and Jews.

By way of illustration, let us take Calcutta, a place which has been designated the "Home of Cholera." There the ratio of cholera deaths among Hindoos and Mahomedans is as 2 to 1. There were in the year 1889, 802 deaths among Hindoos and 247 among Mahomedans, although there are only twice as many Hindoos as Mahomedans. Customs and habits account in a large measure for the difference in the mortality. The Hindoo's life is one which is largely filled up with pilgrimages and festivals, events which exercise a very great influence in the keeping up of cholera. These events are not unknown to the Mahomedans, but they are of much less frequency. To this cause and to a greater use by the Hindoos of polluted water may be assigned the reason why in one town two races of people, living under similar sanitary arrangements as regards housing and conservancy, suffer in such different proportions from cholera. When we come to the European, pure and simple, cholera is an occurrence of exceptional rarity. During five years' experience as Health Officer to Calcutta, I cannot call to mind more than two or three instances of European

residents being attacked with cholera, and in those exceptional cases inquiry has usually elicited some facts connecting the case with milk or food from a contaminated source.

Several of the so-called cases of cholera have not been Asiatic cholera, but ptomaine poisoning such as is met with in Europe, when food which has undergone chemical changes from decomposition has been partaken of. Sheep's brains, sausages, decomposed fish, and curries which have gone wrong, have often set up symptoms which were almost indistinguishable from those belonging to cholera.

This peculiarity regarding the relative incidence of cholera on the Hindoos, Mahomedans, and Europeans of Calcutta is a most importaut fact from several points of view. It reduces the climatic theory of the causation of cholera to a very secondary position. It marks out the influence of good sanitary conditions in preventing cholera, and it shows under these conditions the slight tendency to cholera has to spread, even when people are dwelling in intimate relationship with a community which suffers from cholera; for it may be mentioned that all the servants in a European house are natives, who are in direct communication with the native quarters of the town, and yet even they are comparatively seldom attacked with cholera. The fact has also a very important bearing on the liability of cholera infection being carried by large trading ships from Calcutta to Europe; and, taken in conjunction with another remarkable fact which I shall mention later on, it explains the reason why large ships trading between Europe and India do not convey cholera from India to Europe. This remarkable circumstance does not in the least shake the theory of the transmissibility or communicability of cholera, though much generalisation as to the non-communicability has been based on the fact. My own experience and investigations lead me to the conviction that cholera under certain conditions is a communicable disease, and yet I do not think that cholera has the slightest chance of being conveyed to Europe by any of the large merchant ships which pass through the Suez Canal, and for this reason, that the population which is affected by epidemic cholera in India never travel by ships Were the Hindoo to cross the "Kali Pani," or "Great Ocean," he is "outcast" of his people. Excommunication of a Roman Catholic is not as severe a punishment as that which is included in the sentence of an outcast from Hindooism. He not only loses home and relatives, but he is completely cut off from Hindoo society in its social, religious, and political aspects. This, of course, is not true of a small section of the more highly educated and cultured class.

The ban is one which places the Hindoo population as regards travelling by sea in a perpetual isolation. The quarantine is perpetual, and it is simply an impossibility for the Hindoo portion of the community to spread cholera by the seaward route. The law of isolation is here founded on religion, and no other kind of law could on a highly religious race such as the Hindoos be so powerful in its practical effects. In the exceptional case when the sepoys were brought to Malta, special provision was made to prevent them from losing their caste.

As to the other great race in India, the Mahomedans, though not bound down like the Hindoos not to travel by sea, they, as a matter of fact, are not a migratory race. Once settled in a country they remain there without either desire or ambition to trade with any but their nearest neighbours. A few hundreds of the most daring may be employed as lascars on certain English merchant ships, but that is the full extent of their commercial relationship with Europe. The farthest the Mahomedans do come West towards Europe in their own trading vessels is to Aden and the east coast of Arabia, and the vessels are the smallest of coasters. Indeed, for all practical purposes, the Mahomedans are, so far as regards trade, as isolated by sea from Europe as the Hindoos who never stir from India.

The significance of the foregoing facts is manifest, and may be summarised in the following propositions :—

I. The two great races inhabiting India, and among whom epidemic cholera prevails, have no communication by sea with Europe.

II. That portion of the commercial world which is the connecting link between India and Europe does not suffer from epidemic cholera.

The merchant ships passing the Suez Canal bringing tea, jute, wheat, and other Indian produce to the European markets have not upon them crowds of Hindoos and Mussalmans, poor or rich, from infected districts, but a few better-classed Europeans belonging either to the commercial, military, or official class. The ships are in a good sanitary condition, and there is not the least chance of cholera finding on these ships a nidus for its development or continuance.

The conditions affecting the commercial relations of India are thus totally different from those of European countries to one another or of Europe with America. European countries are not only in closer proximity to each other and not far from America, but on account of that proximity and the facilities of travel from one to another, there is in addition to the ordinary interchange of merchandise a large number of travellers and commercial people passing backwards and forwards. Human intercourse is both very extensive and very intimate. There is not only the shipping of goods to any particular country, but the ship is often crowded with passengers who are natives of the country from which the goods are shipped, and who are visitors or emigrants to the country to which the ship is bound. Then there are the emigrant ships from the different countries of Europe which are bound for America. These are laden with the poorest and the most insanitary classes of the inhabitants of the various countries from which they come, and should there be an epidemic in the land they are leaving, it is precisely among this class of people that it will prevail the most, and it will almost certainly be drafted on to the emigrant ship. I need not cite individual instances. Every epidemic of cholera in Europe has furnished them, and also demonstrated the fact of the importation of cholera from one country into another both by trading and emigrant ships, more especially by the latter. Past experience has equally shown that once cholera is

well established in a European country, no amount of quarantine will prevent it from visiting its neighbour, for in addition to the ordinary traffic, which is dangerous, there is the extraordinary exodus caused by panic, which no State has been able as yet to check.

Cholera behaves the same in Asia as in Europe, when the conditions are similar. I have very little sympathy with the endeavour sometimes made to prove that this is not so. I believe any such attempt is fruitless, and is based on an utterly unreliable foundation. My experience is that when the same conditions of trading exist in Asia as in Europe, cholera is then carried by ships and by persons from one country to another. All those countries in Asia in intimate communication with one another and near enough to be reached by small native coasters and traders, suffer in turn from cholera, which can in particular instances be as clearly traced to importation as those cited in the case of America. For example, Ceylon gets its cholera from Southern India by means of coolies, or labourers and pilgrims; Burmah from Madras by coolies, emigrants, and soldiers; Singapore by coolies and emigrants from China and Java. Japan is infected from China, whilst the islands of the Malayan Archipelago get their cholera from one another by human intercourse. These are all cases of transportation of cholera by ships, coolies, emigrants, and soldiers being the agents by which the cholera is disseminated. In fact, the principal and, perhaps, only source of danger as regards cholera to Australia comes from the relations of Northern Australia and Queensland with the inhabitants of the Malayan Archipelago.

Of the fact that cholera can be conveyed long distances when a ship is crowded with passengers from an infected district, and with a class of people among which cholera prevails in that infected district, we have ample evidence. Only last year a coolie emigrant ship started from Madras and carried the infection of cholera along with it as far as its destination at Durban in South Africa. Several instances have occurred of cholera being introduced into the Mauritius by coolies. Then there are the pilgrim ships from China, the Malayan Archipelago, and India, which arrive at Jedda with cholera on board, and subsequently the carrying of cholera in ships from Jedda.

It is in this latter traffic, as distinguished from British or European trade with India or other Eastern countries, that the real danger of importation of cholera by sea into Europe lies. Mecca, I hold, is the place of danger for Europe—a perpetual menace to the western world. There pilgrims annually assemble from Europe, Asia, and Africa, coming both by land and by sea. In journeying to the holy place by land or by sea, the Asiatics are apt to contract and carry cholera, which finds the most favourable conditions for its extension in the Hedjaz. An outburst having taken place, there is every probability of the returning pilgrims taking cholera to their homes, and from thence it spreads elsewhere. Mecca is over 2,000 miles nearer Europe than any Indian port, and more than 4,000 miles nearer than Calcutta, and consequently, by its great annual gatherings, brings the centre of cholera in its worst form by so much nearer Europe. In this connexion it is important

clearly to understand where exactly the chief danger lies, so that the necessary measures can be applied with every certainty of success; for these applied indiscriminately can only lead, as they have already done, to vexation and disappointment. Up to the present, it seems to me that attention has been directed to the wrong quarters, and there has been useless and harassing restrictions in the shape of quarantine on European trade with the East.

What these measures should be is the important question. I think they may be briefly stated as follows:—Sanitate Mecca, Medina, and Jedda, and the routes between these towns, and regulate the pilgrim traffic. It is impossible to sanitate the whole of Asia, and Asiatic cholera prevails more or less in every hot country in Asia; but it is not impossible to place Mecca and its surroundings in a sanitary condition and to regulate the pilgrim traffic that it shall be carried on in clean and not overcrowded ships under strict medical supervision. By this means the fountain-head of danger from importation of cholera into Europe by sea, if not destroyed entirely, will be very much lessened. To sanitate these places, it seems to me, is primarily to introduce to them a pure water-supply and carefully to guard it against every possible contamination. We have ample evidence to guide us in such a prognostication. The information gathered from investigations into local outbreaks of cholera and the effects on the prevalence of cholera in towns where it was endemic, which have been observed after certain sanitary measures, point out in no uncertain manner the defences which are at our command for the stamping out of cholera.

One of the most remarkable incidents of this kind was the result of the experiment mentioned by Macnamara, in which 19 persons in India were accidentally made to drink water containing cholera excreta, five of whom suffered from cholera and 14 escaped. The well-known outbreak in London in connexion with the Broad Street pump, and the contamination of its water with cholera dejecta, is an occurrence of a similar nature. In 1887, I had the opportunity of inquiring into two simultaneous outbreaks of cholera, one of which was on board ship, the other occurring on land, more than a couple of miles distant. They were discovered to originate from the same cause, but they differed in having a separate vehicle for the distribution of the cholera poison. The outbreak on land was due to the drinking of a water contaminated with cholera dejecta, while the outbreak on board ship (the "Ardenclutha"), arose from a milk supply, adulterated with the contaminated water. Both outbreaks had been primarily caused by the bringing home from a distance of a boy suffering from cholera. The hut to which he was brought to die bordered on a tank in which his infected clothes were washed, and into which the drainage from the hut flowed. The tank water was used as a water-supply by the neighbours who were attacked, and was also employed for the diluting of the milk sold to the crew of the ship afterwards affected with cholera. Similar instances are constantly cropping up in which a contaminated water-supply and milk supply are found to have been the cause of the disease. Only a few days before I left India two high officials in the same town in Eastern

Bengal died of cholera, and the cause was traced by Dr. Gregg, the sanitary commissioner, to the drinking of contaminated milk.

For the town of Calcutta, Surgeon-General Payne's and Brigade-Surgeon McLeod's reports are full of proofs of the production of cholera by contaminated water. As to the spontaneous origin of the disease, I have looked for it in vain. The following history of a small but smart outbreak is a type of that which is constantly presenting itself.

Munshipara bustee is situated in Ward No. 3, extended portion of Calcutta. It is without any drains, and dirty water from latrines, &c. either soak into the soil or drain into the tanks or ditches bounding the bustee. There are three tanks, the water of which is used by the people for washing clothes and utensils and also for bathing. The nearest standpost is not within 150 feet of the bustee. There are no bathing platforms or urinals. The bustee is inhabited by a poor class of Mahomedans, mostly tailors. It was free of cholera for several months. About the middle of February last a few of the people of the bustee went to a fair called Gorachand's Mela, which is held every year on the 20th of February, at Harna, a village in Balanda fiscal division and Bashirhat sub-division. The mela is frequented by both Hindus and Mahomedans. Cholera broke out during the continuance of the fair, and three men of the party were attacked with symptoms of diarrhœa, in consequence of which they came back to their homes on the 26th of February. On the 27th, the three were attacked with cholera. The first death took place on the 28th, the second on 2nd March, and the third on the 3rd March. The fourth case was in the house next to that of the first deceased, and occurred on the 4th March, and the patient died on the same day. The fifth and sixth patients were attacked on the 5th March, and were the daughters of the second deceased; one died on the 5th and the other on the 6th. The seventh patient was a neighbour of this, and was attacked on the 6th and died on the 7th. Two fresh cases occurred on he 7th in the next house; one patient recovered and the other died on the 10th. The next case occurred in the adjacent house on the 8th, and the patient recovered. The ninth case of death occurred on the 12th and the tenth case on the 15th; both patients were attacked on the 11th. Two more cases occurred in the house of the ninth deceased, one on the 12th, the patient dying on the 13th, and the other on the 13th, the patient dying on the 14th. Three more cases occurred in this house, but all the patients recovered. Altogether there were 17 cases of cholera in this bustee between the 27th February and 14th March, and 12 of them proved fatal. The use of the tank water was discontinued by placing a police guard, and the disease has not made its appearance since.

In the same manner, I take it, extension through a village in the country takes place, and the spread from village to village is through human intercourse, *i.e.*, importation of the cholera germ from an infected village to a healthy one.

The following particulars of an outbreak in Rangoon, Burmah, in September 1884, is taken from the official report of 1885, of Dr. Pedley,

formerly Health Officer of Rangoon, with whom I have had several conversations on the subject :—

"A group of 17 cases occurred among a small colony of Munipore people—Brahmins, at Upper Poozoondoung. The community, which seemed to be a large family, numbered about 40 men, women, and children; they were extremely exclusive and lived in a large pucka house and a group of huts; they and their houses were very cleanly compared with Burmese and other natives about them; the site is slightly elevated; on their ground was a well and a small tank; the well, which was regarded as sacred, and from which most of the community drank, was within 12 feet of a latrine which most of them used; the latrine had a deep foul cesspool. No one in the neighbourhood was allowed to use the well or the latrine. There was an abundant supply of pure lake water at a stand-pipe near the house, this was used by the neighbours, but regarded by the Munipoorees as inferior to their own. The rains were on and the well and tank were full, the water of the former showed strong signs of sewage contamination. The people were intelligent and well-to-do; they looked robust and well fed, and volunteered the statement that one of them, an old man, had returned from Henzadah on the 12th. Cholera was bad there, and though not ailing, he was afraid and hastened back to Rangoon. Three days after his arrival his daughter and her child, with whom he was staying, were seized with cholera. Both died on the 16th, and from the 16th to 28th 15 others were attacked, and in all 11 died. I tried in vain to persuade them to abandon the use of the well and take the lake water, and as a last resource desecrated it by throwing in red carbolic powder; this apparently distressed them as much as the loss of their relatives; they afterwards drank the dirty water from the tank. No cholera had been known within a mile for 12 months, and none has been reported since."

In an inquiry into a recent epidemic in Bengal, which I was enabled to carry out owing to the assistance rendered me by several of the civil surgeons of Bengal, it became clearly apparent that importation into the villages was the first influential factor in the starting of a local outbreak, but that the second was extension through a contaminated water-supply. The same fact holds good in the North-Western Provinces of India. Only recently an instance came before the authorities, where, after the Magd festival at Allahabad, cholera was introduced from Allahabad, by returning villagers, into a large village in the Banda district, which had been free of cholera for several years. An outbreak took place, and the inhabitants were literally decimated. An inquiry brought out the fact that the inhabitants were drinking water from a tank into which a cholera corpse had been thrown, and it was with the utmost difficulty that the rest of the inhabitants could be induced not to drink that water. The outbreak at Damietta, in Egypt, in 1883, is another example. After a personal investigation there as to the origin of the disease, though I was not in a position positively to prove my conviction, a strong impression was left on my mind that the disease had been introduced by pilgrims from Mecca, where cholera had prevailed some-

what earlier in an epidemic form. These attended the large fair at Damietta just before the cholera broke out there. The disease having once been introduced into Damietta, the local epidemic was mainly caused by the use of contaminated Nile water, the basin of the river in front of the town having become so low that it was almost stagnant at the time of the fair. This water was used as in India for all purposes, and the epidemic just lasted as long as the water remained in that stagnant and contaminated condition. As soon as the water of the Nile rose and swept out this polluted basin, the cholera disappeared from Damietta, having, however, been carried in the meantime to other parts of Egypt. It is unnecessary to quote further examples of this kind. Suffice it to say that nearly every sanitary commissioner, be he of Bengal, Madras, or of Northern India, has recorded his opinion on the important rôle which contaminated water plays in the extension of cholera. This opinion is supported by the striking result of the marked diminution of cholera following certain sanitary measures in towns where cholera prevails. In Calcutta, for instance, in 1869, towards the end of the year a pure water-supply was introduced, which was distributed by means of public hydrants in the streets and lanes. Such was the abundance of the supply at the beginning that it was practically a constant one. Cholera dropped at once. Prior to the introduction of the public supply, the quinquennial average annual number of cholera deaths had been 4,389, there being 21,948 cholera deaths between the years 1865 and 1869. Following the introduction of the water-supply, the annual average number of deaths in the next quinquennium was only 1,159, there being 5,786 deaths between the years 1870 and 1875, as against 21,948 deaths, which happened in the preceding quinquennium.

Such was the favour in which the water-supply was held, that the inhabitants were clamorous for house connexions; but as these were granted, the supply which had been almost constant when only a street supply became less sufficient and the supply changed into an intermittent one. In the next quinquennium, from 1875 to 1880, the average annual number of cholera deaths rose to 1,493. Matters were allowed to go on and were not rectified; more house connexions were made; the water was not conserved; great waste went on in private houses; the intermittency became greater, and a greater scarcity of water set in in certain quarters of the town, with the result that in the next quinquennium, from 1880 to 1885, the average annual number of deaths rose still higher,—to 1,809.

With the next quinquennium, from 1885 to 1889, a partial remedy was applied; more water was brought into the town; but its distribution remained defective, and it was only during the last two years of the quinquennium that this distribution was improved. Still the average annual number of deaths from cholera has again decreased to 1,466, and during the past two years the average has been only 1,021.

I thoroughly believe that if ever Calcutta obtains a constant system of water-supply, and a plentiful one, and if this supply is well distributed, cholera, for all practical purposes, will be stamped out of Calcutta, and

the cases that do occur will be only those imported from other parts of the country.

Calcutta does not stand alone as showing the benefits to be derived from sanitary measures in the matter of cholera prevention. Among other towns in the East, I have visited Batavia, Singapore, Pondicherry, Colombo, Kandy, and Rangoon, and in each of them have made inquiries into this matter. In Batavia the authorities have introduced artesian wells, with the most satisfactory result, for it has robbed cholera there of its terrors. One of the oldest practitioners in the town, whose experience extended over 30 years, declared to me that it was an unusual thing to see a case of cholera in Batavia, though at one time it was always there. There is plenty of cholera in other parts of Java. At Singapore it is much the same. At one time the inhabitants were constantly suffering from epidemics of cholera, but since the introduction of a pure water-supply and the careful supervision and isolation of emigrants arriving from China, cholera epidemics do not prevail. At Pondicherry the inhabitants find a safeguard in their artesian wells and the cleanliness of the town, and are rarely affected with cholera, though the disease prevails epidemically in the neighbouring districts. The same history can be related of Kandy and Colombo in Ceylon.

It is evident from these facts that the measure of most vital importance in the prevention of cholera is the insurance of a pure water-supply, and my contention is that were such a supply given to Mecca and Jedda, and the routes between the two, no outbursts such as we are familiar with would follow the importation by pilgrims from Asia of isolated cases of cholera, and consequently the pilgrims from Europe and Africa would incur no risk of taking back infection with them. If Mecca and Jedda were once recognised as the principal and most dangerous centres of cholera so far as Europe is concerned, and as the only probable source of importation of cholera by sea, a great boon would be conferred on the maritime trade between Europe and the East, which is at present so often hampered by unnecessary detentions and restrictions imposed by quarantine.

Maritime Quarantine and Indian Cholera.

The discussions on quarantine always assume more the appearance of a wrangle than that of a quiet consideration of the different ways in which cholera is known to spread from one country to another, or of the conditions which affect its extension. This is due mainly to the commercial interests involved, and the introduction into the discussion of the possible losses entailed by interference to commerce. The scientific question has commingled with the commercial, and from the conjunction has sprung up a series of irreconcilable views, each of which has supporters who exert their powers of ingenuity to show that their side is right and others are wrong. The controversy has chiefly waxed strong over the commercial relations of India with Europe; one party declaring that cholera is carried in ships from India to Europe, causing European epidemics; the other that cholera is never carried by ships from India to Europe or to any other part of the world, and never causes an

epidemic. The former would place quarantine on all ships coming from a country in which there was cholera and on all Indian merchantmen, the latter would have no quarantine on ships under any circumstances, whether from India or any other affected country.

The two opposing views may be styled, for clearness' sake, the English and the non-English.

The English view contends that because cholera has never been proved to have been carried by ships from India to Europe and there set up an epidemic, therefore cholera is non-communicable, and can never be carried by ships; a position which is totally untenable, and the fallacy of which is demonstrated in nearly every epidemic recorded.

The non-English view contends that because cholera epidemics in Europe and America show that cholera is communicable and can be carried by ships from country to country, therefore ships from India bring cholera to Europe and start European epidemics. This conclusion also is untenable, not being borne out by observation, and yet it is on this fallacy that Indian merchantmen are subjected to quarantine.

The weak point in each one's case is that neither has limited the conditions on which the observations were made to those conditions alone. Any peculiarity that belonged to these conditions has been forgotten or overlooked, and a wide and inaccurate generalisation deduced for universal application.

The important fact has been lost sight of that the trading by ships between European countries is totally different from that between India and the West, though it is similar in many respects to that carried on between India and the adjoining countries of the East. This fact completely destroys the fitness of any conclusion derived from European experience being applied to India, or *vice versâ*. It can be proved that cholera is carried by ships from country to country in Europe, and that the same thing happens by means of trading and coolie vessels under similar conditions in the East. Yet it can be clearly shown that, owing to the peculiar conditions of the Indian trade with Europe, cholera has not been and is not carried by Indian merchantmen from India to Europe.

Once cholera has gained a footing in any European country the causes of danger to its neighbours are manifest. The different countries of the European Continent are in close proximity and in intimate social and commercial relationship. The sea has very little more isolating effect than the artificial frontiers on the land. Fishermen, travellers, and traders are constantly passing to and fro in *crowds*. Should cholera appear in one country, there is always a panic and a stampede into other countries, which no State can prevent by the most stringent of regulations, and it must always be a piece of good fortune if among these crowds there are not many infected persons.

America also, though isolated by the Atlantic Ocean, has a special danger of its own when cholera is in Europe, not so much from its trade with Europe, which is so considerable, but from that incessant tide of emigration which overflows from Europe and floods the American Continent. Germans, British, Swedes, Austrians, Italians, Russians, Poles, French, and Belgians pass over to the United States alone to the extent

of three-quarters of a million a year. This living freight carried by the emigrant vessels of Europe is not taken from the higher and richer classes of the respective countries, but from the poorest and most insanitary to whom a change is full of promise and of hopes that life in a new country may bring happier and better days and make life somewhat more worth living. The ships are crowded at all times, and whatever special epidemic diseases prevail in the countries from which the emigrants come are sure to be brought onto the ships and find there a favourable home. In this way America has been invaded with cholera in crowds, and we cannot be in the least surprised that the authorities there insist on a modified quarantine.

If the foregoing be compared with the conditions which affect the trade between India and Europe a striking contrast is presented, and the reason becomes clear why India does not in its seaward route endanger Europe with cholera. There are no crowds passing over from India to Europe, fleeing from an invading epidemic, and carrying with them the seeds of the diseases upon them or among their insanitary effects. There are no ships ladened with emigrants or passengers of the poorest and most insanitary class. The social and commercial intercourse by sea is of a very limited nature and confined to Europeans.

True, cholera always prevails in some part of the Indian Peninsula, especially in the Gangetic Delta, but a careful study of its prevalence shows that the great mass of cholera is among the Hindu population, to a lesser extent among the Mahomedans, and to a very slight extent indeed among Europeans. One need not enter here into the causes of the difference of this susceptibility of the different races in India to cholera. It could be shown that it is due to social, religious, and sanitary causes combined. But just as social and religious elements enter into the causation and spread of cholera in India, they also prevent the possibility of extension by sea to Europe. Every Hindu is prevented from crossing the ocean under the religious penalty of losing his caste. Quarantine practically begins in the affected country cutting off all communication with lands beyond the sea. Such is the rigour of the religious law that India is for its Hindu inhabitants a country completely isolated from other countries reached only by the ocean. The Mahomedans also as a nation have no sea trade with Europe. And thus it comes to pass that the two races which suffer epidemically from cholera in India are as far as the sea-going route between India and Europe is concerned never on that route. The nearest approach to it is the route of the crowded Mahomedan pilgrim ships from all parts of Asia going to Jedda for the annual religious gathering at Mecca.

The sea-trade then to Europe is confined to Europeans who suffer only occasionally and slightly from cholera. There may be an occasional outbreak among the sailors when in port mostly traceable to special causes or to excesses in choleraic localities, but these are exceptional and rare, and should a ship go out to sea with cholera cases on board the outbreak is over before the ships has been long at sea, the conditions being quite unfavourable to its continuance, for the ships are not

crowded with emigrants poor and insanitary or with people drawn from the classes among which cholera is epidemic in India. On the contrary, the vessels when they carry passengers are filled with Europeans of the higher and richer class not subject to cholera, and living under the best sanitary conditions on board ship. The only crowded vessels coming from India which might have the slightest chance of carrying cholera to Europe are troopships crowded with soldiers, but so important is the health of the soldier to the Government that the strictest precautions are taken to prevent a disaster of this kind.

The reason then that cholera is not carried by ships from India to Europe, and consequently that Indian commerce by sea does not endanger Europe, is plain. It is because those inhabitants among whom epidemic cholera prevails have no participation in the commerce between India and Europe.

DISCUSSION.

Dr. Leduc (Nantes), said: — J'applaudissais ce matin le Docteur Cunningham, lorsqu'il proposait d'améliorer les conditions sanitaires de nos villes pour nous protéger contre la propagation des maladies épidmiques; mais je me trouvais en desaccord absolu avec lui lorsqu'il proposait la suppression complète des quarantaines.

La science moderne nous enseigne que les maladies contagieuses sont transmises par des germes vivants transportés de l'organisme malade dans l'organisme sain.

Il résulte de ce fait que le meilleur moyen de protection consiste dans l'isolement; l'Angleterre par ses lois sanitaires nous prouve qu'elle reconnaît aussi bien et mieux que toute autre nation la valeur de l'isolement.

Or la quarantaine nous offre le moyen le plus parfait d'isolement pour nous protéger contre la propagation des maladies transmissibles.

Sans doute nous ne saurions conserver les anciennes quarantaines consistant à isoler un équipage jusqu'à ce que la maladie soit éteinte à bord, moyen cruel et grossier.

Mais la science actuelle nous enseigne ce que doivent être les quarantaines; nous avons des moyens de désinfection d'une efficacité absolue, nous devons les appliquer à toutes les merchandises auxquels ils sont applicables et livrer ensuite les merchandises à la libre pratique, ce qui diminuera dans une proportion considérable le préjudice porté au commerce. Les passagers doivent être isolés dans un lazaret satisfaisant à toutes les conditions de l'hygiène jusqu'à ce que la période d'incubation de la maladie soit passée.

Je conclus en disant que proposer actuellement de supprimer les quarantaines c'est proposer une mesure irrationelle et contraire aux principes de la science moderne.

Dr. Thorne Thorne, F.R.S. (London), found so much in Dr. Rochard's statement with which he agreed that he regretted the limit of time compelled him to refer only to points in which he differed from him. The English system did detain the sick, it did place under observation

the suspect, but it refused to place the healthy under the very circumstances calculated to lead to their contracting cholera. All were agreed as to the value of sanitation, as compared with quarantine; the whole question was which measure shall take precedence. We maintain in England that we should never have attained our present sanitary condition had we pretended to protect people by cordons, quarantine, etc. It is when people are told they cannot be thus protected that measures of sanitation take the place of quarantine restrictions, and the fact named by Dr. Rochard that Naples is the only port in the littoral of the Mediterranean where works of water-supply and sewerage have been adopted since the 1884–85 cholera epidemic is a sufficient condemnation of the grave influence exercised by a government promise of protection by quarantine. But, already, two blows have been struck at the quarantine resolution adopted in Rome. Italy herself, has issued from her Foreign Office a memorandum stating that the "solution de la question sanitaire" is that not only should England be allowed free passage of the Suez Canal, but that other countries should adopt it also. Thus, each country would be expected to adopt its own sanitary measures in its own ports. Then again, on two recent occasions English vessels infected with cholera have been refused the passage of the Suez Canal and ordered into quarantine; and the answer has been "Then we shall take the Cape route." Instantly have the quarantine restrictions been given up, the danger to Europe has been forgotten, the ships have been allowed to pass, escorted by guards mounted on dromedaries on the banks of the canal, and so the Canal Company's dues have been secured. Never again ought England to be reproached as placing financial considerations above others as regards this question of quarantine. One word of logic. The 16 days of quarantine decided on at Constantinople in 1866 failed; the 10 days of quarantine decided on at Vienna in 1874 failed, and yet the five days suggested at Rome are expected to succeed. The contention is altogether illogical.

Brigade-Surgeon McGann, Madras Medical Service, Delegate from the Government of Mysore, India, said:—I shall confine my remarks principally to the question of the communicability and transmission of cholera from one country and province to another, and as I have not had an opportunity of preparing a paper on the subject or of reading, with time to reflect thereon, any of the papers which have been read by any of those distinguished men who have preceded me, I shall merely state such ideas as have occurred to me on hearing the papers of Surgeon-General Cuningham, Inspector General Lawson, and others, based on my experience of cholera in Mysore, of which State I have been principal medical officer for the past six years.

I cannot accept the theory put forth by Inspector-General Lawson, that the disease is air borne, as my experience in Mysore has been that it invariably follows the principal routes followed by pilgrims or others coming from infected localities, and therefore it is due to human intercourse in some way.

Into the question of the cause of cholera I do not propose to enter, but I shall refer briefly to preventive measures, and in this connection quarantine shall come first.

In quarantine I do not believe. The period for which persons are quarantined is insufficient, viz., three days in Mysore, to ensure protection to others; it would be practically impossible to confine a large number

of persons, either with regard to measures of safety or economy ; it would in the case of land quarantine drive the people off the main lines of communication and into the by-ways and villages, where they would spread the disease, and where it may be difficult to cope with, and finally the idea of quarantine being protection, which it is not, is liable to beget a false feeling of security and draw off attention from the fact that the greatest safety and security lie in good hygiene and sanitation, both domestic and general.

Medical inspection is very valuable, combined with the removal and isolation of the sick to institutions specially provided for their reception at the principal railway stations or centres of population, as is now carried out by the Government of His Highness the Maharajah of Mysore, but this can only be looked upon as subsidiary to improved sanitation, both domestic and general, above referred to, which is the only true preventive.

The Government of Mysore have now under consideration the important question of introducing measures to improve the sanitary condition of towns and villages, and when this is carried into practical operation, as I trust it will be at no distant date, I am certain that there will be a largely diminished death rate from cholera and such other diseases as are due to or are intensified by insanitation.

The geographical position of the province of Mysore affords special facilities for the introduction of cholera, as it is surrounded on all sides by Her Majesty's territories, and pilgrims are constantly passing through to their places of devotion, and in no instance, to my knowledge, has the disease been introduced, except by means of human intercourse, during the past six years that I have been principal medical officer there.

In the matter of improved sanitation the purity of the water supply ranks pre-eminently first, as exemplified by the great improvement in the health of the inhabitants of those portions of the city of Mysore which are supplied with water from Red Hills reservoir, as contrasted with that of those who still use the water from the old wells in the city; the same may be said of the city of Mysore, since a special water supply has been provided for it.

I have not made any special reference to quarantine as applied to seaport towns, as my experience with regard to it has been principally inland, but as applied to those towns, I regard it as futile and delusive and mischievous, as affording a false feeling of protection, and delaying, or perhaps postponing indefinitely, the carrying out of the real preventive viz., improved general and domestic sanitation.

Prof. Brouardel (Paris), said: — Nous sommes d'accord sur ce point, l'assainissement d'une ville la met à l'abri des importations. Mais je regrette d'entendre toujours discuter les quarantaines. Nous ne nous entendrons pas tant que nous nous servirons de ce mot. En resumé, de quoi est-il question ? Il y a un germe morbide dans les Indes, il s'agit de l'empêcher d'arriver dans nos pays. Pour cela il faut prendre au point de départ dans les Indes des mesures préservatoires, il faut les prendre en cours de route, à l'arrivée. Mais il est probable que les conditions ne sont pas partout les mêmes à l'arrivée, car dans les possessions Méditerraniennes anglaises on prend contre l'emportation des mesures bien différentes de celles ront on vient de vous parler. A Gibraltar, à Malte on repousse les bateaux infectes, on les met en quarantaine à Marseille comme prenant des mesures insuffisantes. Il paraît que les conditions indiquées au point de départ n'ont pas donné les résultats prévus, car depuis deux ans vos bateaux ont apporté le choléra.

Quant aux mesures à prendre en route elles ont donné de meilleurs résultats.

Peut-on encore parler de quarantaine? Il s'agit d'empêcher les germes cholériques de s'embarquer, de les détruire en route ou à l'arrivée. Le temps de l'isolement n'est donc plus que celui nécessaire pour opérer la désinfection.

Je demande donc à nos collègues de nous dire quelles sont les mesures prises au point de départ, j'attends aussi les résultats des communications que seront faites à la section d'assainissement des Indes.

Prof. B. J. Stokvis (Amsterdam), said:—If I take the liberty of taking part in this discussion, it is not only because of the great interest of the subject itself, but also because I had the great honour of presiding at the time of the International Medical Colonial Congress at Amsterdam, where quarantine as a preventive measure for the spreading of cholera was discussed at length. On that occasion, almost the same arguments were used as are now. At that time I had not a settled opinion about the matter in my own mind. But since then I have gained the steadfast conviction that there is in practice only one way to prevent the spreading of epidemic diseases, and especially of cholera in all countries, and that is to make sanitary improvements. How did I obtain that conviction? For the most part by studying the history of cholera in India. The same facts as were observed in British India with regard to the speedy diminution of cholera after sanitary improvement, better water-supply etc., were seen in the Dutch Indian Archipelago. Now I beg you to observe, gentlemen, that if there is any quarantine in the Dutch Indian possessions, it is of no importance whatsoever. Well, the remarkable effect was observed that in the Dutch Indian army the sick-rate and death-rate of cholera has diminished most strikingly, at the same time as the death rate and sick rate of dysentery, a very short time after artesian wells were made, and after sanitary measures were energetically taken. If I may quote some figures, I will state that the death-rate of cholera was, from 1864 to 1878, on an average, 15 per mille in the European army. In 1878 the artesian wells and other improvements were carried out, and now we have the following death-rates occurring:—1879 to 1883, 6·4 per mille; 1884 to 1888, 3·5 per mille. Now these results are as striking as one could ask for. And when quarantine as a preventive measure becomes more and more in disrepute, in my opinion it is especially because it helps to promote carelessness for the public health on the part of governments. The first thing we ought to say to governments ought always to be, make as many sanitary improvements as you can, and do not care a moment about quarantine. The happy results of the sanitary measures in India, although especially applicable to cholera, and making every day more true the saying of the late lamented Prof. de Chaumont, that the time will come when cholera will be only a historical curiosity, are the best proof, that if we all follow the way England has shown to the world, and if we strive everywhere for sanitary improvement, we are taking the only necessary practical measures for preventing infectious diseases. I know Englishmen are a practical people. They do not occupy themselves much with theories, they do perfect work—the improvement of health in India especially is an excellent work—but they do not care much about theories. Now I venture to say that there is properly no discordance between the theory of infectious diseases and the practice of sanitary improvement which had such an eminent success. It is not the time now to give my opinion

at length about the subject, but I should think that from a practical point of view the following thesis can be upheld, which I would formulate in these terms :—

There is no micro-organism, no infectious agent, which can produce disease, unless there is besides the infectious agency some unhealthy condition, either in the living human organism itself, or in the external conditions under which it lives, which can be removed by sanitary improvement. We have it in our power to take these sanitary measures, and so we ought not a moment to defer any measure by which the effect of the infectious agencies on men can be lessened and annihilated. If we have reached that end, we can dismiss quarantine.

The President, Sir Joseph Fayrer, K.C.S.I., pointed out that we are not responsible for Malta and Gibraltar, which have their own regulations as to quarantine, with which we have nothing to do, and cannot control. The importance of sanitary measures has been emphasized over and over again, and whatever part contagion may take as the cause and diffuser of the disease, sanitation is absolutely the only reliable remedy.

Brigade-Surgeon Robert Pringle, M.D., remarked on the uselesness of measures of quarantine in three of the greatest Indian epidemics.

Surgeon-General Henry Cook, M.D. (Bombay), showed statistics of the death-rate of cholera in Bombay for a series of years, pointing out the diminution produced by the use of Vehar water in place of well-water.

Dr. Robert Grieve (British Guiana), advocated the substitution of uniform quarantine measures of a modern type in place of the ancient and varying laws prevailing in different West Indian colonies.

Dr. W. P. Ruysch (The Hague), said:—Comme à La Haye, à Amsterdam, à Vienne et à Rome, nous avons été témoin aujourd'hui du combat entre les quarantainistes ou plutôt les partisans d'une quarantaine modifiée d'après les progrès de la science, observations sanitaires et les antiquarantainistes.

Il faut bien l'avouer, la situation est améliorée. La science a parlé à propos de la nature et la propagation de plusieurs maladies infectieuses, et il n'y a presque plus une partie du monde où on n'avance pas qu'en premier lieu les épidémies doivent être combattues par l'assainissement des villes, l'amélioration de l'eau potable, en général par la méthode preventive, mais puisque la situation n'est pas partout comme il devrait être, il y a des pays, comme par exemple à côté de la Mer Rouge, où il nous faut pour le moment encore autres préventives.

Le moment n'est donc pas encore venu pour être tout d'accord. En attendant quand on ne peut avoir ce qu'on veut, il faut se contenter de ce qu'on peut avoir, c'est une *information sanitaire internationale bien règlée.*

Dr. Ruijsch fixe l'attention sur la haute importance de ce sujet pour la santé publique aussi bien que pour le commerce et les suites funèstres des fausses rumeurs et communications dans la presse à propos du choléra en Egypte, en Espagne, Italie, la fièvre jaune en Amérique, etc.

Les Congrès de Vienne, les conférences de Washington et Rome l'ont avoué, comme il démontre en donnant un exposé des conclusions 1–4 de ces Conférences, spécialement celle de Rome.

Il regrette que toujours encore la demande du dernier Congrès à les propositions de M. Brouardel, da Silva Amado et Ruijsch au Gouverne-

ment de l'Autriche de demander au Gouvernement Italien la reprise de la Conférence de Rome n'a pas donné des résultats.

Il demande les membres du Congres d' exprimer le vœux que le comité permanent s'intéresse pour cette affaire et qu'il prenne en considération la manière à laquelle l'information sociétaire internationelle doit être réglée, de sorte que la question soit examinée de tous côtés, de sorte qu'on peut savoir de quelle manière la question peut être réglée et dans quels cas, toujours en attendant le moment que l'information ne sera plus necessaire, faute d'épidémies, à cause de l'application universelle de la méthode préventive.

Brigade-Surgeon F. W. Staples remarked on the geographical distribution of cholera and its varying character in different parts of the world. Insanitary accommodation, bad air, water and food were the essential conditions of its development.

Deputy Surgeon-General Professor Cayley (Netley), said:—Quarantine is ineffectual, because it is impossible to carry it out thoroughly in practice, whether by land or sea. In many cases quarantine has an effect in preventing the introduction of cholera. Very often in Indian jails, quarantine (though we cannot rely on its being effectually carried out) does prevent cholera when the disease is raging outside. We do not know how long the poison of cholera may retain its vitality in clothes, water, and other media, and therefore supposed quarantine arrangement on board ship must be ineffectual. This in no way disproves the idea that cholera can only be conveyed to countries at a distance from its home by means of human intercourse, but as quarantine cannot be effectually carried out we ought to rely upon home sanitation, the value of which we do know from experience.

Surgeon-General Joseph Ewart (Brighton), said:—I have little or nothing to add to the observations of Surgeon-General Cuningham. I agree with him in condemning quarantine so far as cholera is concerned. By no arrangements of this kind can its dissemination be curtailed. The evidence is all the other way. The vaunted security of the system has always failed. Indeed, by leading the public to believe that quarantine gives security against the spread of the scourge, real sanitary precautions are neglected, and so its spread is facilitated. Real security against the propagation of cholera is to be afforded, as stated by the author of the paper, not by delusive measures of quarantine, but by the most perfect development of all those arrangements which provide pure air, and abundance of it, pure and wholesome water, good and efficient drainage, and healthy and commodious homes for the people. It is, in all human probability, due to these that England has escaped invasion during the last two European epidemics. It is by the development of all possible sanitary precautions that this pestilence will be extinguished in its home in Bengal, and until this is accomplished, its spread to and in countries beyond cannot be moderated and prevented.

Surgeon-General Beatson, M.D., late Deputy Surgeon-General H.M. Indian Army (Eastbourne), said:—That with regard to the difference of opinion which has been expressed concerning the necessity and efficacy of quarantine he must give his entire adhesion to the general opinion expressed by his respected brother officer, Surgeon-General Cunningham. He believed that the difference between the opinions of Dr. Cunningham and other speakers was really not great. He felt sure that Dr. Cunningham would not advocate the admission into unaffected localities of cases of

declared cholera or small-pox. He considered that these diseases are not at all comparable. In small-pox there was a tangible poison conveyable by exhalations from which no person exposed to it may hope to escape. In cholera we do not know that there is such a poison—probably there is, but it is not communicable as small-pox is communicable—numbers exposed to it escape. He himself was a living example, for he had lived in a city where cholera was endemic, and had often felt himself saturated by the emanations and odours in which he had been immersed.

In 1881 he was deputy surgeon-general at Lahore during a cholera epidemic, and that epidemic could not be traced to introduction. When the disease began to cease he knew of fresh cases being imported without further extension. While, therefore, he would endeavour to keep out disease of any kind by reasonable measures, he could not advocate any rigid form of quarantine.

Dr. Vincente Cabello (Madrid), said:—Appropos de cette intéressante question je vais faire quelques observations sommaires sur un des moyens les plus efficaces pour favoriser la propagation du choléra d'un peuple à un autre.

Mes observations ne sont personels apropos d'une mission de laquelle je fus chargé pour étudier la dernière épidémie colérique de l'Espagne.

L'origine de cette épidémie fut l'importation de la même de Toulon et de Marseille, occasionné par le contreband des vieils habits et des linges usés, achetés en Espagne pour alimenter les frabriques de papier ruinées par le décret defendant cette trafique pendant l'existence de l'épidémie.

En effet dans la ville de Novelda entre Valence et Alicaute, qui fut l'endroit où le choléra commença, on trouva des uniformes de forcats du bagne de Toulon. Ces uniformes procédant de l'introduction fraudulente des vieux draps, lesquels provenant de Toulon et de Marseille était embarqués pour Oran d'où devait les prendre les petits vaisseaux contrabandiers de l'Espagne.

Une autre preuve de l'importance du contreband dans la propagation de la maladie fut observée aux Pyrénées avant de l'épidémie en Espagne.

Afin de nous défendre du foyer d'infection de Marseille nous organisons le service de surveillance et désinfection dans les gares de la frontière francaise, au bord la Méditerranée, et de l'Océan, et le succes fut parfait, malgré la communication journalière, mais le choléra se g issa dans le Nord de la Catalogne à le province de Serida, produit par les guides des Pyrénées, lesquels empêchés de se gagner la vie à cause de l'épidémie, se convertirent en contrebandiers pour favoriser, malgré la vigilence des troupes, le passage fraudulent des personnes et des effets qu'on voulait soustraire aux mesures sanitaires des gares frontières.

Le petit foyer donc vient d'être faite indication fut promptement étouffé.

Ces données doivent nous inviter à adopter en dessus des mesures que nous pourrons dire "normales" et parfaitement apropos aux circonstances selon les données scientifiques que nous possédons, mais auss extremer tous les moyens possibles pour empêcher le développement du contreband, exacerbé précisément à cause de l'épidémie.

The Geographical Distribution, Pathological Relations, and Life History of filaria sanguinis hominis diurna and of filaria sanguinis hominis perstans, in connexion with Preventive Medicine.

BY

PATRICK MANSON, M.D., LL.D., M.R.C.P.

In no class of disease can preventive medicine boast of so many and complete victories as in connexion with disease dependent on animal parasites. The steps by which these triumphs have been brought about were, in nearly every instance, almost identical. First, a parasite is discovered; next, multiplied observations show that this parasite is intimately associated with particular morbid conditions; then, the life history of the animal is worked out, and, acting on the knowledge so acquired, the association of parasite with disease is scientifically proved by deliberate and set experiment; finally, preventive medicine steps in, and, in virtue of its knowledge of the life history of the parasite, authoritatively lays its finger on a particular point of a complicated and at places exposed life cycle and says, "Here, at this particular point, "interfere, and in an easy and very practicable though, possibly, very "commonplace way slay the parasite and prevent the disease it was on "its way to produce."

This consummation I desire to see brought about in the case of two newly discovered parasites. As yet, however, but the first step in the process of evolution of knowledge in regard to them has been made. They have been discovered; that is about all. Their pathological associations have as yet hardly been guessed at; and their life histories, likewise, can only be conjectured. These points have to be worked out ere preventive medicine can interfere in an intelligent and scientific way. I bring the matter before this section of the Congress in the hope that by spreading the little we do know, other workers, with opportunities better than those we enjoy in London, may take the matter up and supply the knowledge necessary to enable preventive medicine to bring it to a practical and successful issue.

When Lewis, in 1872, found for the first time in human blood the embryo worm which he named filaria sanguinis hominis, he distinctly foresaw the possibility that in the future similar discoveries might upset the claim of this worm to the exclusive right to the name he had given it; accordingly, he said that the name was a provisional one. What the scientific insight of Lewis predicted as possible has come to pass. Last year not one but two additional species of human blood worm were brought to light. Now, as these probably belong to the filaridæ they have as good a claim to be called filaria sanguinis hominis as the blood worm on which Lewis originally bestowed this appellation. It therefore becomes necessary, whilst naming these new worms, somewhat to modify the name of the original filaria sanguinis. This title, however,

is so apt and so descriptive that, at the risk of its appearing too long, I propose to retain it as a sort of generic term or classifier for the filarial hæmatozoa of man in general, taking advantage of certain well-marked characteristics belonging to each species to provide specific names.

Observation has shown that Lewis's filaria appears in the blood under normal conditions only during the night, disappearing from it during the day; whereas the opposite is the case with one of the new worms, for it appears in the blood only during the day, disappearing from it at night; and, as regards the other new species, it is found to be present in the blood at all times, both during the day and during the night. On these facts I propose to base a nomenclature, and to call the worms respectively:—

Filaria sanguinis hominis diurna,
Filaria sanguinis hominis nocturna,
Filaria sanguinis hominis perstans.

In the following remarks I shall employ these names or an abbreviation of them; but I wish it to be understood that, however convenient

Fig. 1.
Filaria Sanguinis hominis diurna × 275.

Fig 2.
Filaria Sanguinis hominis nocturna × 275.

and appropriate they may be at present, I advance them only as provisional, and pending the discovery of the mature forms of the embryos they refer to and the complete exploitation of the human blood.

I will spare you a detailed description of filaria diurna and filaria perstans. Those interested in such details will find them fully set forth in the "Lancet" of 3rd January of this year. The specimens under the microscopes and the photographs will give you as accurate an idea as is necessary of their structure, appearance, and habits. Briefly, and as bearing on what I have to say in the sequel, I may state that the filaria sanguinis hominis diurna is practically indistinguishable from the well-known filaria sanguinis hominis nocturna of Lewis, as far as appearance goes; but the fact of its observing an exactly opposite periodicity in its entrances and exits from the blood proves it to be quite another and distinct species. For such a habit means that the filaria requires a different intermediary host—an intermediary host of diurnal habits like itself; whereas we know that the mosquito serving the filaria sanguinis hominis nocturna as intermediary host is nocturnal in its habits, and, therefore, quite unsuited to play this role for the diurnal filaria sanguinis hominis diurna. As regards filaria perstans, you can see that it is much smaller than the other blood worms; that it has no sheath like them; and

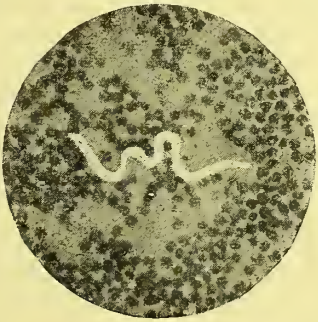

Fig. 3.

Filaria Sanguinis hominis perstans × 275.

These figures are reproduced from photo-micrographs by Mr. E. Detmold.

that its caudal end is blunt—not pointed. Further, if you watch it carefully under a high power, you may see that it possesses a very minute retractile beak; that it is not stationary, but moves about in the blood, wriggling much as the other two species do, but, unlike the other two species, locomoting—if I may use the expression—as well. Moreover, it has the power of so stretching itself that it can reduce the diameter of its body to an exceedingly fine line, or of retracting itself to the dimensions you see in the photographs I submit which represent its usual or average appearance.

From what I have said, and from what you can see, I do not think there can exist the slightest doubt that the first step bearing on an interesting problem in preventive medicine has been made; but as to any real advance in regard to the rest of the helminthological evolution

I spoke about as leading up to sound preventive practice I cannot be so positive. Some facts, more or less connected, I have collected, and on these I have based a certain amount of speculation. The facts I regard as of value, and I commend them to your notice; the speculations I advance with diffidence, and only for what they are worth. I would not have ventured to bring them forward at all in their present crude form were there any reasonable prospect of my personally ever being in a position to test their value. I feel that the problems they suggest have to be worked out elsewhere, in Africa, on the spot, so to speak. About all we can hope to do here is to call attention to these problems, and to excite such a degree of interest in them that others, more favourably situated, shall be tempted to take them up. If I succeed in this, I shall feel that the object of this paper has been accomplished.

As far as I have been able to ascertain filaria sanguinis hominis diurna and filaria sanguinis hominis perstans are limited in their geographical distribution to the west coast and adjoining interior districts of tropical Africa. There is no record, as far as I am aware, of systematic examinations of the blood of the natives of any part of Africa except Egypt. As regards Egypt, the admirable researches of Sonsino, to my mind, conclusively prove the absence of these parasites in that country; so careful, hard working, and experienced an observer would not have overlooked them. I have little doubt, did they exist on the eastern side of the continent, we would have heard of them long ago from such centres of civilization as Aden, Zanzibar, Natal, the Cape. I have examined a good many negroes from the West Indies and from Zanzibar, but in none of them have I found either of the parasites. Nor have I been more successful in natives of India, Malasia, or China. Altogether, for the purposes of this investigation, I have examined the blood of 45 individuals from different parts of the tropical world, but it has only been in natives of the West Coast of Africa that I have succeeded in finding these particular hæmatozoa. Of 12 West Coast negroes examined I found filaria sanguinis hominis diurna in two, filaria sanguinis hominis perstans in six; and in two of these the parasites co-existed. As far as one may be allowed to infer from the limited number of cases examined, it would appear that, though limited as regards geographical distribution, these worms are fairly common in the districts in which they are endemic.

Another fact :—Filaria sanguinis hominis perstans and, probably, filaria sanguinis hominis diurna are long lived, and may continue in the blood for years after the endemic district has been quitted. In one instance I found filaria perstans in a negro who had not been in Africa for six years; in another the period was nine months; in a third, seven months; and, as the latter has filaria diurna as well in his blood, it is probable that this parasite, too, is equally capable of supporting a prolonged exile. In this respect, doubtless, these filariæ agree with filaria sanguinis hominis nocturna which, it is well known, once established in the human body lives for many years and in any climate.

Now, if either of these parasites has a pathological bearing, the distribution of the disease or diseases it produces must be in strict conformity to the geographical distribution of the parasite. Again, as the parasite

may continue to live for years after its host has quitted the strictly endemic area, we may expect that the liability to the disease it gives rise to will continue for years after the African has quitted Africa. Further, as the parasite can only be acquired in the first instance in a certain part of Africa, the disease it may produce will never be found unless in some one who has visited this particular region, or, at all events, had more or less intimate physical relations with it.

If, then, we are to blame these parasites with causing any specific disease before drawing up the indictment against them, we must see that the disease we pitch on conforms to these three conditions. Is there any such disease? I think there is; but, unfortunately, our knowledge of it is so indefinite and scanty that it is perhaps rash to be quite positive. The disease known as Negro Lethargy, or the Sleeping Sickness of the Congo, seems to conform to the three conditions I have formulated. First, it is well known to be endemic on the west coast of Africa and adjoining parts; Second, it is certain it may develop years after the endemic region has been quitted; and, third, the evidence, though necessarily of a negative character, is very strong that it can only be acquired by one who was born or has resided within the endemic area.

The endemicity of sleeping sickness on the west coast of Africa is a well established fact, and may be accepted without discussion.

The liability of the negro to the disease for years after he has left Africa is not so generally known; nevertheless, the evidence for this fact is equally incontrovertible. Several writers on the diseases of the West Indies affirm it, and I myself am cognisant of the occurrence of sleeping sickness in a negro lad three years after he came to this country, the boy having never quitted England, and having enjoyed good health in the interval. In the days of the slave trade a serious proportion of the terrible mortality habitually occurring during the passage from Africa to America arose from sleeping sickness—Nicolas* says one per cent.; and it was constantly remarked that the mortality from this disease did not stop with the passage, but that cases of it kept cropping up among the imported slaves for years after they had landed in the Antilles or on the American continent.

As to the other point, the immunity enjoyed by negroes and others who had never been to Africa, this is what Le Roy Mericourt,† quoting Guerin,‡ says:—"But it is a singular thing that it (meaning sleeping sickness) has never been announced as occurring in the pure blooded negro born in the Antilles;" and again, "All the cases collected by "Dr. Guerin (he had 134 at Martinique) were blacks coming from the "coast of Africa with at most five to eight years' residence in the "Antilles." Argumosa,§ a Spanish writer, records two cases occurring in Cuba, but he adds that the negroes attacked came originally from Africa.

* Gaz. Hebd., 1861, and 18th Oct., 1863. Ac. des Sc., 10th Mai, 1880.

† Mal. de Som., Dict. Enc. des Scien. Med., 1871.

‡ De la Maladie du Sommeil., Th., Paris, 1869.

§ Gaz. Med. de Paris, 1879.

I am aware that sleeping sickness has been spoken of as a disease peculiar to the negro race, as if the liability to it were in some way a racial peculiarity, just as the woolly hair and dark skin are. If this were really so it would be a strong argument against the necessary association of the filariæ with the disease. But if sleeping sickness is a purely racial disease, why do we not find it everywhere where the race is to be found? Why do we not hear of it from the southern states of the Union, for example, from Jamaica, or from those of the Antilles into which African negroes are no longer imported? Clearly, if authors are to be trusted, and if an important medical fact has not been overlooked, sleeping sickness is a disease incidental to place, not to race. Nor are we altogether without evidence pointing to its occurrence in races other than the negro. Corre* states that he had heard of it in a European and also in a Moor, and Chassaniol† refers to its occurrence in a mulatto. Its comparative rarity in Europeans in the endemic area is easily explained.

I think you will agree with me that the facts so far are strongly suggestive of a connexion of some sort between the filariæ and sleeping sickness. I shall now try to bring forward evidence of a more direct character pointing in the same direction.

Corre, whose account of sleeping sickness is by far the best we have, and who writes from intimate personal acquaintance with his subject, having studied it most carefully on the spot, and whose knowledg of its literature seems to be complete, says that a frequent occurrence in the course of sleeping sickness is the development of an itching papulo-vesicular eruption on the skin. He says, "But a fact "worth remarking is the frequency of small papular or papulo-vesicular "swellings on the limbs and trunk, especially on the chest, swellings "which, according to the blacks of Joal and Portudal, give rise to a "characteristic pruritus." In his narrative of cases Corre frequently alludes to this eruption. Bestion‡ evidently refers to it when he says, "The patient presents on his lower limbs and especially on the chest "grey crusts the size of lentils," arising, doubtless, from vesicles ruptured by scratching. Other writers speak of the same thing; so that we may safely conclude that if not, perhaps, a constant symptom, this papulo-vesicular eruption is a very common occurrence in sleeping sickness.

In the "Lancet" (February, 1875), Dr. John O'Neil describes, under the name of "craw craw," a disease which is said to be very common on the west coast of Africa. "Craw craw," he says, "at first "sight suggests the presence of scabies in all its stages of development." Resembling scabies we may infer that the eruption is papulo-vesicular in character, and that it is attended with intense pruritus. Dr. O'Neil examined the vesicles in six cases of this disease, and in all of these he says he found a falaria-like parasite in the contents of the vesicles.

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* Gaz. Med. de Paris, 1876. Arch. de Med. Nav., 27, 1877. Maladies des Pays Chauds, Paris, 1887.

† Arch. de Med. Nav., 3, 1865.

‡ Arch. de Med. Nav., 36, 1881.

In 1882, Professor Nielly* described a case of what he called "dermatose parasitaire" occurring in the person of a French lad who had never been out of France. This, too, was a papulo-vesicular disease in which a filaria-like parasite was found in the vesicles. O'Neil, it would appear, did not examine the blood in his cases of craw craw; but Nielly did examine the blood of his case of dermatose parasitaire, and it was found on one occasion to contain a hæmatozoon which a competent observer, well acquainted with the filaria sanguinis hominis nocturna, pronounced ***not*** to be that parasite.

Professor Nielly expresses his conviction that the disease he called dermatose parasitaire was identical with O'Neil's craw craw; and I would suggest it seems reasonable to suppose that O'Neil's craw craw, considering its objective and subjective symptoms, and its geographical distribution, is virtually the same affection of the skin as Corre's papulo-vesicular eruption of sleeping sickness.

It is impossible to doubt that the parasite Professor Nielly found in the blood of his case of dermatose parasitaire was directly related to the parasite he found in the vesicles on the skin. If this is the case, and craw craw and dermatose parasitaire are the same disease, then we may expect to find in the blood of craw craw cases a blood worm as well; and if in craw craw, then in those cases of sleeping sickness in which there is this itching papulo-vesicular eruption, that is, according to Corre, in most cases.

I do not know, in fact, considering all the circumstances of the case I am inclined to doubt that the parasites producing the respective dermatoses of O'Neil and Nielly are the same; but I feel convinced that, if not perhaps the same species, they are closely allied, and in habit resemble each other. O'Niel's description of his parasite is, unfortunately, somewhat meagre; very possibly he supposed it to be the filaria sanguinis hominis nocturna, which at the time he wrote had only recently been discovered. But that it was not the filaria nocturna is evident from his description and drawings. The filaria sanguinis hominis nocturna shows no such feature as "two black specks on its head" as he describes and figures; and, moreover, it is so retentive of life that it would not have stretched itself out and died within a few minutes of its transference to a glass slide, as O'Neil describes his parasite as doing. Professor Nielly gives a very careful description of the parasite he found in the vesicles of his dermatose parasitaire. He mentions the double black marking at the cephalic end referred to by O'Niel; and he further states, that by using picric acid stain and pressure he could demonstrate a well-marked pharynx and alimentary canal. Now, there are no such anatomical features in filaria sanguinis hominis diurna, nocturna, or perstams. It follows, therefore, that the parasite or parasites of these skin affections is either an entirely new species, or, as as is more probable, an advanced stage of one of the already known species, probably of one of the hæmatozoa. And as the particular

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* Acad. de Med., Avril, 1882. Arch. de Med. Nav., 37, p. 337.

skin disease is almost, if not entirely, confined to a particular district of Africa, it cannot be related to the filaria sanguinis hominis nocturna; which, as regards the tropics, is almost pandemic. Further, although in Nielly's parasite there was a well developed alimentary canal, the sexual organs were quite rudimentary. From this fact it is evident that the organism was little more than a slightly advanced embryo. It had, therefore, a long process of development to go through before it could arrive at maturity; its position in the skin was probably taken up to facilitate one of the steps to this, and must be regarded as being only a temporary one and not as the permanent home of the animal.

Considering these facts, I have come to read Professor Nielly's parasitism as follows, and, if my conjecture as to the parasitism of craw craw and sleeping sickness is correct, the parasitism of these diseases also. Somewhere in or in close connexion with the circulation there is a mature filaria or filariae, the young of which get access to the blood and circulate with it. Sooner or later these embryos, obeying a natural instinct, leave the circulation by penetrating the capilliaries and take up their abode in the skin. Here they enter on a second stage of their life history, acquiring an ailmentary canal and becoming equipped for a temporarily independent existence. After a time their presence in the skin produces a degree of inflammation which gives rise to a characteristic papulo-vesicular eruption and an intense pruritus; and this, in its turn, to the scratching which leads to the rupture of the vesicles and liberation of the parasitic contents. If this is effected in or near water an opportunity is afforded the worms to search out in this medium a suitable intermediary host. Further development ends in their escape from the intermediary host into the water again; and so, by way of this fluid, they again get access to a human host in whom they take up their final abode, attain sexual maturity, and complete their life cycle.

It will occur to you to ask, if sleeping sickness and craw craw are associated with one of the new blood worms, which of the two is it filaria sanguinis hominis diurna or filaria sanguinis hominis perstans? Unfortunately, in the only undoubted case of sleeping sickness,* I had an opportunity, through the kindness of Dr. Stephen Mackenzie, of examining, both worms were present. If in this case either worm was etiologically related to the disease the concurrence of the other must be regarded as accidental; but which was the etiological worm and which the simply concurrent one we cannot, judging from this case alone, say. I have seen another case of cerebral disease in a negro from the west coast of Africa which in some respects bears a close resemblance in some of its features to sleeping sickness. In this patient's blood only one species of filaria was found, and this was the filaria perstans. Besides this evidence, the value of which, did it stand by itself, is but slight, there are one or two features in connexion with the anatomical structure of filaria perstans which seem to suit it specially for entering on the life cycle I have sketched, and therefore tend to incriminate this parasite.

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* This case is fully reported by Dr. Mackenzie in the Transactions of the Clinical Society, Vol. XXIV., 1890.

Filaria diurna has a sheath which, one would think, would effectually interfere with its burrowing its way out of the vessels; its structure in other respects, as well, is so like that of filaria nocturna that analogy would lead us to suppose it at least commenced its life history in a similar way; that is, that it was passive as regards its removal from the circulation, and was dependent, like filaria nocturna, on the friendly offices of some such agent as the mosquito. Filaria perstans, on the other hand, is not hampered by a sheath; moreover, it has a beak, and this beak, undoubtedly, has a purpose, and what more probable than that this purpose is the penetration of the tissues. In the blood even it exhibits a tendency to travel. Its body is extensile to facilitate its passage through the tissues, and its tail is blunt to afford it a firm support in pushing its way onwards. So I read these things. Unfortunately, O'Neil's drawing of his craw craw parasite so represents it that one is left in doubt as to whether it has a pointed tail, like that of filaria diurna, or a truncated one like that of filaria perstans; he describes it as being "bluntly pointed," whatever that may mean. It may be that there was some error or carelessness in observation here, for, to be quite sure of a minute detail of this kind, which at the time may not have seemed to be of much importance, requires considerable experience and care, and it is quite possible that O'Neil was influenced by preconceived ideas about the appearance of what he may have taken to be the filaria sanguinis hominis nocturna. Neither is Professor Nielly's description of the caudal end of his worm very distinct, either as regards its skin form, or as regards its blood form. We gather from the description of the latter that it was not filaria nocturna, and, therefore, we are justified in inferring that it could not have been filaria diurna, as the two species are morphologically identical, or almost so. So that if Nielly's parasite was either of the new worms it must have been filaria perstans.

From all this, I take it, that a good *primâ facie* case has been made out against one of these worms, probably filaria perstans, as being the cause of sleeping sickness. I do not overlook the consideration that the concurrence of two phenomena is not sufficient evidence of a cause and effect relationship; or the fact that in a region where both disease and parasite are common they must necessarily concur in a certain proportion of cases. But, on the other hand, we must recollect that the concurrence of a rare parasite with a rare disease is in itself a significant fact; and its significance is very much increased when we consider that disease and parasite correspond as regards geographical distribution. What other theory can better explain, what I may call, the long incubation period of sleeping sickness, and the total absence of this complaint among negroes and others who have not visited the endemic area? Significant, too, is the constancy, or, at all events, the great frequency of the concurrence of the parasite with the disease, as I would have you infer from the argument based on the skin affection common to sleeping sickness, craw craw, and Nielly's dermatose parasitaire. And when we consider the inexplicable character of sleeping sickness on any other hypothesis, I think that, as I have said, a good primâ facie

case has been made out against one of these worms. I do not say the case is proven, or anything like proven, but I think we have a clue now which is well worth following up.*

I will not attempt to discuss at length the method or methods by which these parasites may be supposed to damage the nervous system and bring about pathological conditions. We concern ourselves, at present, more with etiological than with pathological questions; and, moreover, we do not have any facts of importance to guide us as to the exact way in which the morbid influences are applied. It is manifest, however, that though well adapted as the hæmatozoa are to circulate in the blood with impunity, both to themselves and their hosts, the position they occupy is, so to speak, a very delicate one, and that the slightest deviation from perfect health either on the part of the parent worm or of the free embryo must be fraught with danger to the host. I have elsewhere shown that in the case of filaria nocturna a slight hurrying of the process of parturition in the adult female may result in embolism of the lymphatics by prematurely expelled ova, and I have to-day placed under the microscope a preparation of lymph containing embryo filaria nocturna from a case of lymphatic varix, lately in the London Hospital, which suggests another possible source of lymphatic embolism in the case of that parasite. This preparation shows a large number of embryo filariae entangled together in a sort of verminous ball, and, on looking at it, one can readily understand how such a group of worms projected into the circulation would act as an embolus. In the case of filaria nocturna the embryos have, as a rule, in the first instance, to pass through a chain of lymphatic glands, and thus the fluid containing them is filtered of any such mass as we see under the microscope; thus, although the lymphatics may be damaged thereby, the danger of embolism of blood vessels is averted. Even supposing no lymphatic gland intervened between the parent worm and the blood, supposing that the parent filaria lay, as she probably often

* Professor Leuckart writes me that he recently received from the Gold Coast two verminous tumours which a medical missionary had excised from natives; one of them from the scalp, the other from the integuments of the thorax. On cutting into these tumours they were found to contain masses of parental filariæ, male and female, coiled up in burrows, or twisted round each other in intricate masses. The fluids surrounding them were laden with innumerable embryos. Through the kindness of Professor Leuckart I am enabled to show you under the microscope some of those embryos, and, on comparing them with filaria diurna and filaria nocturna, you will at once see how closely they resemble these. Doubtless, the Professor will give us in due time a careful and exhaustive description of these interesting parasites, which he has named filaria volvulas. Meanwhile, the question occurs to us, may not filaria volvulas be the parental form of filaria diurna? If it is it must in some way communicate with the circulation. If I understand Professor Leuckart's description aright, in the verminous tumour there was a small hole opening onto the surface; and I opine that it is by this channel the embryos of these worms obtain their liberty; and that they do not enter the circulation, and, therefore, can have nothing to do with filaria diurna. However this may be, it is evident that we have still a great deal to learn about the guests our poor human bodies are called on at times to entertain.

does, in the thoracic duct, the products of abortion, or such verminous aggregations as that to which I call your attention, will be filtered out by the capillaries of the lungs, and no very serious harm can result to the host. But suppose no such filter as the lymphatic glands and the lungs intervened between the parent worm and the general circulation; suppose the parent worm lay in the arterial system somewhere (as was the case with the parasite described by Magalhães*) in some vessel connected with the cerebral circulation, for example, what would the consequences be to the host of such an embolus or of a series of such emboli leaving the uterus of the parasite? I do not say this is the pathology of sleeping sickness; I only bring the speculation forward to show that, given a filaria in direct relationship with the circulation, a very small disturbance of the normal state of health of the parent worm or physical relations or conditions of the embryos may be sufficient to bring about consequences disastrous to the host.

Before concluding my remarks on this part of my subject, I would deprecate any criticism founded on observations on the presence or absence of hæmatozoa in the blood made by slip-shod and untrained observers; and I would also point out, that although in a given case of sleeping sickness hæmatozoa may not be present at the time of the examination, this, in itself, is not sufficient reason for concluding that they or their parents were not the cause of the disease; for, it must be recollected, effects often remain when their cause has disappeared.

I do not think that the mature form of filaria perstans has ever been seen or described, but I do think that in the long, but imperfectly known filaria loa of the eye of the negro we have the mature form of filaria diurna. Certain it is that if filaria loa is not the parental form of this hæmatozoon there is yet another and fourth blood worm waiting discovery in man; for, there can be little doubt that the embryos of loa, in order to continue their species, must escape from the human body through the medium of the circulation. One of my patients, who had filaria diurna and filaria perstans, told me, that in childhood he had a loa in his eye, that it was never removed, but disappeared after the application of a little common salt to his conjunctiva. Professor Leuckart very kindly, in answer to some inquiries, sent me his drawings of the embryos of a loa which he had received from Africa; these embryos are represented as having sharp tails, and their general appearance corresponds with that of filaria diurna. Professor Leuckart informs me that Sonsino, to whom he showed these embryos, declared them to be indistinguishable from the ordinary filaria sanguinis hominis nocturna with which he was so familiar. So that, without being quite positive about it, I am strongly inclined to regard filaria loa as being the mature form of the hæmatozoon I have named filaria sanguinis hominis diurna. It will, doubtless, be found that not every one who

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* Filarias encontrados no coração humano; Filariose de Wucherer: Revista des Cursos theoricos epracticos da Faculdade de Medicina de Rio de Janeiro; N. 3, Anno III, 1886.

has these hæmatozoa has a history of a loa in his eye, and I can conceive that on these grounds some may take exception to this opinion of mine. But we must bear in mind that the filaria loa is evidently a wanderer, and, therefore, may occur in any part of the body, and that it is only when in its wanderings it crosses the conjunctiva that its presence becomes known. It would be absurd, however, to infer that there was no loa in the body because it does not happen to be visible in the eye.

So much for the mature form and the embyronic form of filaria diurna. I think I can indicate likewise where we will have to look for its intermediary forms, and also its intermediary host. The patient I have just referred to, and who is a lad of great intelligence, told me that in Old Calabar, where he comes from, there are two species of fly which infest the plantations, and are exceedingly troublesome to the field workers. He tells me there are a red kind, called in the native tongue Uyo, and a black kind known as Ukpom. Both species are blood-suckers, and are voracious to a degree. They come out during the heat of the day and attack any exposed part of the body. After drinking their fill of blood they drop off, gorged and too heavy to fly, and are just able to crawl away to some place of shelter. Missionaries and travellers familiar with this region tell me that they are well acquainted with similar if not the same flies. They are common on the creeks and rivers, and are known to Europeans as "Mangrove flies." It appears to me that the habits and geographical distribution of this insect point to it as a suitable intermediary host for filaria diurna.

I have no facts which indicate precisely the intermediary host of filaria perstans; but the way in which it escapes from the human host, if my conjectures in this respect are correct, and its possession at that stage of an alimentary canal suggest analogies to the embryo filaria medinensis, which, as is well-known, seeks out an intermediary host in a fresh-water cyclops. So I am inclined to believe that filaria perstans continues its history, after escape from its original human host, in a similar fashion, that is, in some fresh-water animal. What this particular animal may be I cannot guess.

From this we may infer that a part of the life-cycle of one, if not both of these worms is passed in fresh water, and that it is most probable that it is through the medium of drinking water that the parasites pass from one human being to another. It is at this point of the life cycle that preventive medicine may get an opportunity. Prevent the filariae getting access to the water, or destroy them, or remove them from the water before it is drunk, and the diseases they cause will not occur.

How many and what diseases these parasites give rise to we cannot, in our present state of ignorance about them and the countries they infest, conjecture. Analogy would lead us to suppose that, though very common in their native haunts, and in the main innocuous, they become, under certain unknown conditions, sources of grave danger. The evidence I have brought forward for incriminating one of them as being the cause of the deadly disease known as sleeping sickness is very strong

indeed. If this hypothesis turns out to be well founded, then these parasites will acquire an importance far beyond that of many a much-talked of microbe, beyond even than that of rabies itself. The mortality from sleeping sickness in its native haunts is enormous. Corre tells us how it depopulates villages, and how the natives flee from it as from the plague; and Corre's account of it in Senegambia is confirmed by the recent reports of our missionaries on the Congo. Though less rapid in its progress than rabies, it is just as deadly, for, if sleeping sickness is once developed, death from it within a few months is inevitable.

I do not pretend, as I have said, to explain how either of these worms could produce sleeping sickness, but, if my hypothesis is correct, I can indicate with precision how the disease can be prevented. Give the villages good wells in place of their present filth-laden puddles, educate the natives in the gospel of cleanliness, and the plague of sleeping sickness will cease. This is the consummation preventive medicine should work for.

I feel that in the forcgoing observations I have tacked a maximum of speculation on to a minimum of fact. This has not been for want of endeavour on my part to collect facts. But I have found working in England on an African disease a very unsatisfactory business, and I feel that the limit of knowledge on the subject acquirable here has been about attained. I, therefore, now appeal to medical men, missionaries, and travellers in Western Africa to assist in gathering information which, in time, may lead up to a scientific and successful preventive medicine by bringing together a larger body of information bearing on these parasites and the diseases they produce.

As an aid to those who may be willing to take the matter up, I have, in an appendix to this paper, drawn up directions for making collections of blood from natives, and have also given a description of the methods I have found, after a considerable experience, to be the best for rapidly and surely finding and demonstrating the filarial hæmatozoa. The naturalists and medical men attached to the many expeditions which are now traversing Africa in all directions, may, if they choose, find in the fauna and flora of the blood of the natives a highly interesting and practical field for observation and study.

I fear I have already occupied too much of the time of the section; but I am tempted to quote, as a sort of postscriptum, and as an encouragement to us to follow up the scent we are on, a letter which I received, only a few days ago, from Dr. Grattan Guinness, a medical gentleman of great intelligence and energy, at present travelling on the Congo. Dr. Guinness, before leaving England in the spring for Africa, familiarised himself with the methods of detecting the filariæ in the blood, and also with the views I have expressed about their pathological relationships. This is what he says about the sleeping sickness:—
"Passing three days further up the Congo cataract region I came to "M'Banza Manteka. Here I have seen plenty of cases of the sad "malady we are so interested in. It scarcely bears any resemblance "at all to Beriberi, and could only be mistaken for it by ill-informed

" observers. I suppose I have personally examined at least 12 typical
" cases. They are reproductions of the story of Mandombi." (Mandombi was the name of Dr. Stephen Mackenzie's patient already referred to.) " In brief, the brightest and most intelligent are frequently amongst " the sufferers. Insidious 'sleeping' symptoms often enough attract " attention. Perhaps, more frequently, a change of countenance, loss " of brightness, peculiar puffiness of the cheeks, and lack-lustre con- " dition of skin and eyes may indicate to the outside observers the " presence of the disease, before the person recognises the malady " himself. Many are slow to acknowledge they are smitten, though it " is all too evident. Active workers become lazy, then weak, &c. " Mentally they rapidly deteriorate, and sometimes there is a " stubborness or perversity developed which is trying to their friends. " They scratch themselves, and one of the earliest symptoms is the " white streak on arms, chest, abdomen, or legs, left by the nail. In " one case, to which I paid particular attention, and who suffered " severely from irritable skin, I found that the itching was worse at " night, when it sometimes kept him awake, but that it disappeared " about 7 to 9 a.m. to return from 6 to 9 p.m. next evening.

"The maniacal form of the disease is rare. Mr. Ingham, a " missionary here, tells me that during the past four years about 100 " people have died from this disease, but that only four presented " maniacal symptoms. Of these, he thinks probably three starved to " death, and one, by neglect, perished in high fever. (N'Coyo would " have starved to death long ago, had it not been for special atten- " tion.)." I may mention that the N'Coyo here referred to is the patient I spoke about as suffering from cerebral disease. He is at present in a lunatic asylum in England.

Dr. Guinness goes on to remark :—" How about the microscope? " Well, I carefully examined every typical case, and *they all present* " *filariæ.* I am, however, puzzled, for I could not swear to having " seen two parasites in any of them." He evidently means two species of parasite, such as were found in Mandombi, with whose case Dr. Guinness was familiar. " The worm I have seen under the one- " inch, the one-sixth, and one-twelfth immersion may thus be described :— " Intensely active, and exhibiting *marked locomotive tendencies*, unless " caught in the coagulated fibrine network. The head presents a " curious spot which appears glistening white every now and then in " certain positions of the extraordinarily motile extremity. The head " appears to alter its shape incessantly, protruding and becoming " pointed, or rapidly withdrawing, as if it had touched something that " its sensitive point shrank from. Sometimes it clearly turns round " and looks up at the observer. The body slopes off gradually into the " rounded tail. It is *both diurnal and nocturnal* in its habits, but is " never represented very numerously in any given specimen of blood. " Occasionally I only found one in three slides, but then I sometimes " found three or four in one slide, and occasionally I found two in the " same field of my one-inch objective. This numerical paucity is " rather like what we found at home."

Dr. Guinness's letter contains a number of other and very interesting observations. Those I have quoted satisfy me, and I believe they will you, that he had to deal with sleeping sickness and filaria perstans.

APPENDIX I.

On the Demonstration of Embryo Filariæ in the Blood.

The presence of embryo filariae in the blood is very often overlooked in consequence of the faulty and imperfect methods of examination employed. So it comes about, as Lewis long ago predicted, that in reports of cases of chyluria, lymph-scrotum, and other forms of filaria disease, and in which the filaria is almost certainly present, the remark is so frequently met with that the parasite was sought for in the blood, but was not found. In this way an unwarranted scepticism as to the true pathology of this group of diseases is apt to be engendered. I have therefore thought it worth while to append a few observations on those methods of demonstrating the filariae which, in the course of a considerable experience, I have found to be the most reliable, and the most rapidly and easily applied.

The commonest mistakes made in searching for the filariae are:—1st, the use of too high a magnifying power; 2nd, employing too strong an illumination; 3rd, searching unmethodically and in too small a quantity of blood; and 4th, looking for filariae in blood drawn from the body at a time when the particular species sought for is normally absent from the circulation.

Before describing how I recommend the blood to be prepared, I will offer a few remarks under each of these heads.

1st. *The magnifying power.*—It is almost a hopeless task to search for these parasites, even when they are present in the blood in millions, with a quarter inch or any higher objective. With such powers the chance of coming across a filaria, in what must necessarily be a very limited field, are infinitesimally small. An inch or a three quarters of an inch objective is sufficiently powerful for all searching purposes. If the power is high enough to define a blood corpuscle it will detect a filaria. The lower the power the larger the field; and the larger the field, within certain limits, the greater the chance of encountering what is sought for. Once found it is an easy matter to centre the object, and to change the low power for a high one, if the intention is to study the structure and movements of the worm. But for searching, or to ascertain presence or absence, to find in the first instance, a low power must always be employed; a high one is practically useless.

2nd. *The illumination.*—A very common mistake is to make this too strong. Filaria embryos, being quite translucent and refracting light in about the same degree as the liquor sanguinis, are readily overlooked when the illumination is bright and dazzling. They arrest the attention most readily when feebly illuminated. Therefore, in scrutinising the blood, a feeble illumination ought to be used; about the same amount of light as one employs when searching for tube casts in the urine is the best.

3rd. *The amount of blood to be searched and the method.*—If only a thin film of blood, such as one would prepare for examination for bacteria, is examined, the chance of finding filariae in it is proportionately small, and very many slides must be searched before it is safe to pronounce in a negative sense about their presence. It is important, therefore, to make the film of blood as thick as is consistent with the probability of not overlooking any parasite it may contain, in consequence of its being concealed by dense aggregations of blood corpuscles. In wet or recent preparations of undried and unstained blood this film must be very thin, and not more than the sixth part of a drop spread out under an inch cover glass should be attempted at a time; six such slides at least should be carefully searched before absence of filaria is definitely pronounced on. And these slides must not be searched in a haphazard sort of way, but systematically, bit by bit, a smoothly working mechanical stage being used to aid in this. This is a very tedious process, however, and very trying to the eyes; but

if we would study the habits and structure of the filaria, we must put up with it. For simply ascertaining presence or absence of filariae in the blood the method which I shall presently detail is infinitely more certain, rapid, and much less trying to the observer.

4th. *The time of examination.* — This is another matter which is frequently ignored. In ordinary circumstances of health and habit the filaria sanguinis hominis nocturna is rarely to be found in the blood during the day. Accordingly, the blood, when this particular parasite is being searched for, should be drawn at night. Any time between seven or eight in the evening and seven or eight in the morning will do, but it is best to take it near midnight. On the other hand, the filaria sanguinis hominis diurna is rarely to be found, under ordinary circumstances of health and habit, in the blood during the night. Accordingly, in searching for it, the blood must be drawn during the day. It is best to take it between 11 a.m. and 8 p.m.; the nearer one o'clock in the afternoon the better. Should, however, our object be to ascertain the presence or absence of the filaria sanguinis hominis perstans the blood may be drawn at any hour of the day or night, as this worm, when present at all, exhibits no periodicity corresponding to that of filaria nocturna and diurna; but, as it is much smaller than either of these, and therefore more readily overlooked, and as it is generally present in very much fewer numbers, a large number of slides ought to be searched, and the scrutiny be most carefully made, before the absence of this parasite is definitely pronounced on.

Referring to this matter of filarial periodicity, observers must bear in mind, that it is just as useless to look for the filaria sanguinis hominis nocturna in blood drawn during the day as it would be to look for an owl at mid-day; and as useless to look for filaria sanguinis hominis diurna in blood drawn during the night as to look for a butterfly after sunset. The habits of the filariae must not be ignored.

To ascertain with certainty the presence or absence of filaria embryos in the circulation in any given case, I recommend the following procedure:—Ligature and prick the finger in the usual way. When a fair-sized drop of blood has exuded transfer it to the centre of a glass slip by dabbing this on to the blood two or three times, so that all the drop, or nearly all, is transferred to the glass. Immediately spread the blood so transferred, using a glass rod or the edge of a slide or the needle for this purpose, so that it shall cover, in a fairly uniform layer, about an inch square of the glass. The blood is then allowed to dry. At this stage the examination may proceed at once or be deferred to any time to suit the observer's convenience; if kept from damp the slide will not spoil. To demonstrate the filariae in blood so prepared, a stain of some kind must be used. Carmine, logwood, cochineal, and some others which I have experimented with, do not stain the filariae. Picro-carmine gives fair results, but the best stains I have worked with are a half per cent. solution of eosin, and a very weak solution of fuchsin (one drop of the saturated alcoholic solution to an ounce of water). These stain the filariae very deeply, and at the same time discharge the colour of the red blood corpuscles. The slides ought to be immersed in the stain for two or three hours, and then examined either without being mounted, or after mounting in glycerine jelly or Farrant's solution. Except the white blood corpuscles, the only other deeply coloured objects to be seen on placing such preparation under the microscope, are the filariae, should the slides happen to contain any. Accordingly, if present, they at once catch the eye. In the case of the eosin and picro-carmine preparations the stain is fairly permanent, but the fuchsin preparations fade in a very few days.*

* It may happen, and this has invariably been the case with some hundreds of slides of dried blood I have obtained from the tropics, that the eosin and fuchsin solutions described stain corpuscles, liquor, sanguinis, and filariæ indiscriminately, and the preparations after immersion in the stain come out one blotch of deep colour unsuitable for examination, and yielding no information. In this case washing the *fuchsin* preparations with a very weak solution of acetic acid—one or two drops to the ounce of water—will discharge the colour from everything except the filariæ, and, perhaps, portions of the many cryptogamic growths frequently met with in slides from hot countries. Eosin is not affected by the acid, and I do not employ it as a stain in old blood slides from the tropics.

Prepared in this way, a large quantity of blood can be effectually searched in a very few minutes, and, should it contain any filariae, they are sure to be detected. This method has another important advantage over the examination of fresh blood, seeing it can be undertaken at any time to suit the convenience of the observer, either immediately or weeks or months after the blood was dried on the slide. And I would suggest that travellers and residents in new countries, willing to advance our knowledge of this branch of helminthology, might avail themselves of their opportunities, and, at very little trouble to themselves, make collections of dried blood slides, such as I have described, which could be subsequently examined, and which, very likely, would yield interesting if not important information.

As I have said, this method is an excellent one for ascertaining presence or absence of filariae in any given subject; but, unfortunately, in consequence of the shrinking and distortion of the delicate body of the parasite during the drying of the thick layer of blood, preparations so obtained are not from a microscopical point of view all we could wish for, and are apt to give a wrong impression of the size and structure of the animal. In them the body of the little creature is shrunk to about half its original length, and the sheath characteristic of the filaria nocturna and diurna does not show up at all. Although the filaria perstans usually retains some of the graceful curves which it exhibits when alive the other two species in these dried slides are not only shrunk, but are distorted and fixed in unnatural attitudes, either awkwardly bent in a single curve, or straight with the tail tucked under the body, or thrown into ungraceful wriggles.

To demonstrate the points of the filaria satisfactorily, to show the sheath in filaria nocturna and diurna, and preserve their natural and graceful curves, it is necessary that the blood be spread in a very fine film, so that it may dry rapidly, or almost instantaneously on being spread on the slide. Such a film may be obtained by placing the newly drawn blood between two slides, and, after allowing the blood to spread out, rapidly pulling or gliding the slides apart. After drying and staining such a preparation with eosin or an aniline dye the filaria, in many places where the film of blood is thinnest, can be seen natural in size and attitude, and is altogether a very graceful object to look at.

But the situation as regards colouring is exactly the reverse of what obtains in nature; the filaria is coloured, and the blood is colourless. In casting about for a method of so preparing the blood that the normal relations should be preserved in this respect also, I hit upon the following plan, which gives very beautiful results indeed:—Make a very thin film of blood in the way above described. Immediately, and before the blood has had time to dry, place the slides, face downwards, over a capsule or watch-glass containing a few drops of acetic acid, so that the fumes of the acid, but not the fluid itself, impinge on the drying blood. When the blood has quite dried, immerse the slide for two minutes in a half per cent. solution of eosin, wash in one or two waters, dry, and mount in balsam. On examination it is now found that instead of the filaria being stained and the blood corpuscles being colourless exactly the opposite is the case; the filaria shows up a beautiful pearly white against an eosin stained setting of corpuscles and liquor sanguinis. Where the film is very thin, the parasites appear exactly as they do when in life; but where the film is a little thicker, and where, presumably, the blood has taken a little longer to dry, the body of the filaria is seen to have contracted, leaving the collapsed but uncontracted sheath as a delicate, but very visible, appendage at head or tail or both.

There are other ways of demonstrating the sheath of the filaria sanguinis hominis diurna and nocturna, such as by adding urine, salt solution, or serum to the blood, but none of these gives so good a result as that which I have described, and which, in addition to its other merits, is suitable for making permanent preparations.

APPENDIX II.

DIRECTIONS to TRAVELLERS, MISSIONARIES, RESIDENTS, and OTHERS in AFRICA for the PREPARATION and STORING of SLIDES OF DRIED BLOOD, &c.

Objects to be kept in view.

1. To ascertain the extent of the endemic area of filaria sanguinis hominis diurna and filaria sanguinis hominis perstans, and of any other blood worm.
2. To ascertain the proportion of the population affected within the endemic area.
3. To ascertain if particular villages or districts are specially affected whilst others are comparatively exempt.
4. To ascertain if the parasites are specially associated with particular diseases, and, if so, which parasite with which disease.
5. To ascertain the influence of age, sex, occupation, &c., and any other point of interest.

Materials required.

Ordinary glass microscope slips, three inches by one inch; one, two, or more thousand. On each end of the slides a label one inch by three-quarters (the greater length being across the slide) of cardboard the thickness of a moderately stout calling card, should be gummed, so as to leave a space of an inch and a half in the middle of the slide free to take the blood. A box such as is commonly used for carrying microscope slides; it should be made of wood, and nailed or screwed, or otherwise made to stand heat and damp; and it ought to be capable of holding 30 to 40 slides. Several bayonet pointed or flat straight surgical needles; ordinary stout sewing needles will do.

A register with the following headings :—Number ; name ; age ; sex ; occupation ; residence ; water-supply of same ; travels ; disease, if any, both past and present ; diseases of village, specifying particularly presence or absence of sleeping sickness, craw craw, &c. ; date of preparation of slide ; hour of ditto ; remarks.

To prepare the slides.

Clean the slides very carefully. Slightly constrict the last joint of the blood-giver's finger by making three or four turns of a string round it. Prick the pad of the finger so constricted with a clean, sharp needle. When a droplet of blood has exuded, or has been squeezed from the prick, transfer it to the glass slip, on the same side as that to which the labels are attached, by dabbing the slip several times on the blood. With a needle or glass rod spread the blood so transferred in an even layer over an area of about three-quarters of an inch by an inch and a quarter. Lay the slide on its back and protect it from dust till it is dry, then place in box. From time to time pack away the charged slides, first tying them in bundles of a dozen, blood surface to blood surface (the thick cardboard labels will prevent contact of blood), and back to back. See that they are thoroughly dry—no fire should be used to effect this—before packing them finally away, if possible, in tin-lined cases. At the time the blood is drawn the labels should be marked with a number corresponding to that in the register, and also, if deemed necessary, with the name, age, &c., and other particulars.

In the case of the vesico-pustules of sleeping sickness and craw craw, open them with a needle or sharp knife ; scrape out the contents, unmixed with blood, with a knife, and transfer them to a slide, spreading them out as in the case of the blood.

Two slides of blood should be taken from every case, and in sleeping sickness and craw craw as many of the vesico-pustular matter in addition to the usual two slides of blood.

The best time for taking blood, if the object be to ascertain the presence or absence of *filaria diurna*, is about 1 or 2 p.m., but any hour between 11 a.m. and 9 p.m. will do. If *filaria nocturna* is sought for, draw the blood sometime between 9 p.m. and 6 a.m. Any hour will do for filaria perstans.

DISCUSSION.

Dr. Sonsino, (Pisa) said:—Je trouve que la découverte de deux nouvelles filaires dans l'homme a une grand importance, parce qu'elle vient à expliquer l'origine de certaines maladies décrites imparfaitement depuis longtemps, comme la léthargie de l'Afrique et le *craw-craw*, mais qui jusqu'ici sont restées sans explication dans leur pathogénie. La découverte de Manson est appuiée à la présence dans plusieurs cas des embryons de nématodes dans le sang de l'homme, avec des différences de caractères qui correspondent toujours à des différences dans les désordres morbides chez l'hôte. Mais on sait bien que les différents caractères des embryons des nématodes n'ont pas une valeur absolue, et que la distinction des espèces ne peut être faite qu'en connaissant l'état adulte du ver. De cette manière la découverte de Manson reste fondée pour le moment sur une présomption qui est certainement bien appuiée, mais qui restera toujours une présomption tant qu'on n'aura découvert les vers adults de chaque éspèce. Mais la relation reconnue par le Dr. Manson entre la *léthargie* et le *craw-craw* d'un côté, et une filaire dans le sang de l'autre côté, reste toujours un fait bien important, et elle est une nouvelle gloire de l'esprit original de notre savant confrère qui déjà en Chine avait découvert la périodicité des embryons de la *Filaria nocturna*.

Ce même fait de la présence des embryons circulant dans le sang à certaines heures de la journée et disparaissant dans d'autres, avec une précision admirable, a été, il faut en convenir, une grande découverte pour la physiologie et pathologie, parce que, comme du reste on a déjà observé, ce fait se lie probablement à bien d'autres faits de périodicité toujours obscurs, et surtout avec la périodicité des fièvres de malaria et avec l'augmentation nocturne constante de presque toutes les fièvres.

Le même fait de la périodicité a été vérifié par Manson dans la première filaire du sang de l'homme connue, c'est à dire la *Filaria sanguinis hominis* Lewis. Cette filaire avait été déjà vue dans l'anneé 1863, par Demarquay dans le contenu d'un hydrocèle, et a été trouvé ensuite par Wucherer dans la chylurie dans l'anneé 1866, date à laquelle on rapporte généralement sa découverte. Elle a été depuis trouvée dans le sang par Lewis en 1872, dans les Indes, et par moi aussi deux ans plus tard en Egypte, et plus tard encore par Bancroft en Queensland en Australie.

Wednesday, 12th August 1891.

The Chair was occupied successively by
The President, Sir Joseph Fayrer, K.C.S.I., M.D., F.R.S.;
Dr. Pistor (Berlin);
Surgeon-General Roth (Saxony);
Sir John Banks, K.C.B., LL.D., M.D. (Dublin);
Overlaege Bentzen (Christiania).

Diphtheria: with special reference to its Distribution and to the Need for Comprehensive and Systematic Inquiry into the Causes of its Prevalence in certain Countries and parts of Countries, with a view to its Prevention.

BY

Edward C. Seaton, M.D., F.R.C.P., &c.

No climate appears to give immunity from the prevalence of this disease, but the tropics suffer less than cold and temperate climates. During the present century, in Europe, France has been the principal centre for diphtheria. But, from accounts given by Dr. Hewitt, the health officer for the State of Minnesota, U.S., certain tracts of country in that great State are even more remarkable centres of diphtheria. In England, Longstaff has studied the distribution of the disease. He has taken his facts from the abundant statistics of the 26 years ending 1880, and has graphically displayed in a shaded map the local mortality. This is shown to be light in Devonshire, Cornwall, and the Midlands, and heavy in Norfolk and Wales. The disease does not obey the law which determines the prevalence of others of the zymotic group. Unlike them, it prevails more in the country than in towns. But there has been observed of late years an increasing incidence of diphtheria upon the more dense populations as compared with the less dense. Another remarkable feature in the prevalence of diphtheria is that its mortality has risen in England synchronously with the adoption of extensive works of water-supply and sewerage during the last 15 years. The reduction of enteric fever is, by common consent, ascribed to these improvements. It may be that the mortality from diphtheria would have been greater but for these improvements, but of this there is no proof. The author re-asserts his belief that (contrary to the doctrine almost universally taught), there are but slender grounds for supposing that diphtheria is influenced favourably or unfavourably by what are generally termed sanitary conditions. He gives instances from his own experience in the Midlands, and in connexion with the work of the Metropolitan Asylums Board, in support of this assertion. He also gives a recent experience of a Surrey village, in which the disease had prevailed in an epidemic form, shortly after the replacement of an old insanitary cesspool-system by a new and elaborately constructed sewerage-system. The occurrence of the disease under these circumstances gives rise to a suspicion that there might be a connexion between

diphtheria and conditions of soil which needs to be investigated in a comprehensive and systematic manner. The same point has been referred to by physicians who have had special opportunities of observation, and latterly it has been dwelt on by Dr. Thorne-Thorne, F.R.S., in his Milroy lectures at the Royal College of Physicians.

The importance of these main considerations, namely—(1.) The prevalence of the disease in strikingly different degree in countries in the same latitude and with similar climatic conditions, and also in parts of countries close to each other; (2.) The fact that it has not apparently been influenced favourably by the adoption of sanitary measures which have been generally found effective in reducing the death-rate; prove the urgent necessity for a comprehensive inquiry by our Government, acting in this respect with the Governments of other countries, into the causes which determine the prevalence of diphtheria. Such an inquiry should take into account what has already been ascertained with regard to the occasional causation and spread of the disease by milk, and the influence which schools have on its production and spread, and also the subsidiary influence of dampness, dirt, overcrowding, etc.; but its main object would be to ascertain the local conditions and circumstances which account for the disease being endemic and becoming epidemic. To ascertain these, the inquiries must, of course, be made in countries marked by freedom from the disease as well as in those which suffer from it.

TABLE showing the SYNCHRONOUS FALL OF ENTERIC FEVER and RISE OF DIPHTHERIA MORTALITY (Thorne-Thorne).

Annual Mortality per 1000 Persons living.

Years.	England and Wales.*		London.†		Large Towns.‡	
	Enteric Fever.	Diphtheria.	Enteric Fever.	Diphtheria.	"Fever."	Diphtheria.
1871	·37	·11	·27	·10	—	-
1872	·38	·09	·24	·08	—	
1873	·38	·11	·27	·09	—	—
1874	·37	·15	·26	·12	—	
1875	·37	·14	·23	·17	—	—
1876	·31	·13	·22	·11	—	—
1877	·28	·11	·25	·08	—	—
1878	·31	·14	·28	·15	—	—
1879	·23	·12	·23	·15	—	—
1880	·26	·11	·19	·14	—	—
1881	·21	·12	·25	·17	—	—
1882	·23	·15	·25	·22	·37	·16
1883	·23	·16	·24	·24	·35	·16
1884	·23	·18	·23	·24	·29	·17
1885	·17	·16	·15	·22	·20	·17
1886	·18	·15	·15	·20	·23	·16
1887	·18	·16	·14	·23	·22	·18
1888	·17	·17	·16	·30	·20	·21
1889	·17	·18	·12	·37	·20	·26

* The Registrar-General's 51st (1888) Annual Report, p. 52.

† The Registrar-General's 51st (1888) Annual Report, p. 53.

‡ The figures for 1882 onwards, relate to the 28 large towns mentioned in the Registrar-General's Annual Summaries. Similar information for preceding years is not obtainable from the Registrar-General's Report.

Contribution à l'Étude des Causes de la Predilection que montre la Diphtérie pour certains Cantons.—Sa Distribution en Belgique.

PAR

le Dr. Schrevens, Tournai, Vice-Président de la Société Royale de Médecine Publique de Belgique.

La question de la dipthtéric, posée par le Comité de la première Section du Congrès de Londres, était bien faite pour nous engager à venir joindre nos efforts à ceux des hygiénistes anglais, que nous reconnaissons comme nos maîtres; désireux de profiter de leur longue expérience, nous leur apportons le faible tribut de nos observations.

L'an dernier, au sein de la Sociéte Royale de Médecine Publique de Belgique, je proposais à tous les praticiens belges une enquête générale sur lcs différents modes de contagion de la diphtérie; c'était un des côtés de la question qui nous est soumise aujourd'hui; ce n'est en effet que lorsque nous saurons bien de quelles façons diverses la maladie se contracte, se communique, se répand, que nous pourrons prendre des mesures sérieuses, efficaces, pour mettre obstacle à son extension, pour en arrêter ou en atténuer les ravages.

En Avril dernier, au cercle de Tournai je pouvais déjà fournir les premiers résultats de cette enquête et laisser entrevoir quelques déductions naturelles dont l'importance au point de vue de la prophylaxie ne peut être contestée.

Je serais entrainé trop loin si je voulais relater ici les faits déjà nombreux qui ont été analysés et qui ont servi de base à mes conclusions; je dois me borner à formuler celles-ci pour entrer ensuite dans la question même proposée par le comité.

Plusieurs de mes observations personnelles et de celles qui m'ont été communiquées, me font admettre la transmissibilité de la diphtérie des animaux à l'homme; Messieurs les Docteurs Destrée et Janssens de Bruxelles avaient déjà parlé des pigeons comme des agents propagateurs de cette maladie; les cas qu'il nous a été donné d'observer et dans lesquels l'origine aviaire semble démontrée, se rapportent surtout aux poules italiennes et aux coqs de combat qui, paraît-il, sont particulièrement sujets à contracter la diphtérie, les premières probablement en vertu de leur race insuffisamment acclimatée, les seconds à cause de leur jeune âge et du régime échauffant auquel ils sont soumis pour les préparer à la lutte; nous avons aussi recueilli quelques faits qui démontreraient l'intervention possible des pigeons et même des canards.

C'est souvent chez ces animaux que les épidémies de diphtérie prennent leur point de départ; ce sont eux qui reprennent les germes en picorant dans les fumiers, dans les immondices, dans les équevilles et qui leur rendent la vie avec toutes leurs propriétés novices; dans

plusieurs enquêtes, dirigées sans aucun parti pris, je suis parvenu à trouver en tête de la série des victimes, ou même dans quelques cas isolés, le coq de combat qui avait mis les germes en circulation.

Les insuccès des bactériologistes dans les efforts qu'ils ont pu faire pour arriver à démontrer la possibilité de la transmission de la diphtérie des animaux à l'homme, n'entachent en rien leur réputation de savants et d'opérateurs ; ces insuccès se comprennent parfaitement par la difficulté que l'on doit éprouver à reproduire dans des expériences de ce genre des conditions qui sont d'ailleurs entièrement indéterminées.

Mais faut-il attendre que la preuve expérimentale nous soit apportée pour admettre un fait aussi clairement démontré par l'observation clinique ? Devons-nous, en attendant peut-être bien longtemps encore, nous borner à regarder froidement ces milliers d'enfants tués par la diphtérie ?

J'espère qu'il n'en sera pas ainsi et que la conviction de cette transmissibilité de la diphtérie des animaux à l'homme parviendra, par la démonstration seule des faits impartialement interprêtés, à s'imposer à un assez grand nombre d'esprits pour qu'on se décide à prendre sans trop tarder les mesures d'hygiène publique qui en découlent et qui seules pourront arrêter les progrès envahissants de cette terrible maladie.

On n'a pas hésité à prendre des mesures pour prévenir la contagion de la tuberculose par l'usage du lait et de la viande des vaches phtisiques et l'on vient encore de contester au Congrès de Paris l'identité du bacille de la tuberculose de l'homme et de celui de la pommelière.

Ce n'est cependant pas sans difficulté que le bacille de Löffler parvient à se fixer sur les muqueuses humaines, en venant de l'animal ; c'est là ce qui explique selon nous la rareté relative des cas où se manifeste clairement ce mode de contagion ; l'émigrant a de la peine à s'acclimater, à s'adapter à ce nouveau milieu, tandis qu'une fois qu'il a pris pied sur un organisme humain, le germe dipthtéritique se communique beaucoup plus facilement à d'autres sujets du même genre ; c'est ainsi que se développent les épidémies ou que se produisent les recrudescences formant des foyers secondaires dans les localités où la maladie avait réussi déjà à s'implanter, où elle avait pris droit de domicile.

C'est dans les écoles gardiennes et primaires que la diphtérie se transmet surtout d'un enfant à d'autres ; le germe y est même souvent apporté par des sujets indemnes qui se sont trouvés dans un foyer d'infection ; aussi est-il absolument indispensable d'éloigner immédiatement de l'école les frères et les sœurs d'un sujet atteint de diphtérie ; je dirai plus, il ne faut pas hésiter à fermer temporairement l'école et à procéder à sa désinfection générale du moment que plusieurs élèves auront été successivement atteints de diphtérie.

Quant à la contagion dans les familles où un premier cas de diphtérie vient à se déclarer, on commence bien à savoir généralement qu'il est prudent d'isoler le malade, d'empêcher les sujets sains, et surtout

les enfants d'en approcher, on sait aussi qu'il est nécessaire de désinfecter la chambre après la guérison ou la mort du sujet atteint, mais on ignore que pas un objet ne peut être sorti de la chambre sans avoir été soumis à l'action d'un désinfectant, et c'est encore là une source de contagion; des germes diphtéritiques peuvent s'être déposés sur cet objet et être par lui portés au dehors.

Et comment se pratiquent ordinairement chez les particuliers l'isolement et la désinfection ? Les enfants sont éloignés, mais souvent on les envoie dans des maisons où se trouvent d'autres enfants que l'on expose ainsi directement aux dangers de la contagion; ce sont là des fautes grossières que nous avons relevées à plusieurs reprises et dont nous avons constaté les fatales conséquences; on n'a pas pris soin de désinfecter les enfants venant du foyer primitif; et d'ailleurs ne peuvent-ils pas être déjà envahis par le germe dont les manifestations ne tarderont pas à apparaître ? Il est donc nécessaire, dans les localités où la diphtérie est endémique, d'avoir des maisons spéciales de refuge pour y recueillir provisoirement, et y tenir en observation les enfants venant d'une maison infectée et qui sont par là suspects d'infection.

Et la désinfection elle-même, comment se fait-elle ? Remarquez, Messieurs, que je ne parle ici que de ce qui se passe chez nous, et encore dois-je excepter la ville de Bruxelles où fonctionne depuis vingt ans un service public de désinfection que le Gouvernement belge vient avec raison de proposer comme modèle à toutes les communes du pays.

Le médecin recommande à son client de désinfecter la chambre du malade; c'est au moins son devoir; parfois il songe à lui prescrire les substances à employer ; supposons même qu'il donne des explications complètes sur leur emploi; mais c'est presque toujours aux particuliers qu'on abandonne le soin de l'opération et celle-ci est naturellement fort mal dirigée ; la désinfection est incomplète et par là même elle inspire une sécurité trompeuse et pleine de périls; un an, deux ans après, le bacille fait dans la maison de nouvelles victimes ; il s'y est tenu blotti dans quelque coin, attendant une occasion favorable pour rentrer en scène.

Cette mauvaise organisation de la défense ne nous explique-t-elle pas la facilité avec laquelle la diphtérie parvient à se perpétuer dans une localité ? Ses germes sont éparpillés, semés partout, dans tous les quartiers, et à tout instant ils relèvent la tête sur un point ou l'autre, l'endémie diphtéritique est constituée.

Le germe étant apporté dans une localité, toutes les négligences que nous venons d'énumérer sont certainement de nature à l'y entretenir, à lui permettre de proliférer à l'aise, d'y fonder des colonies et d'y perpétrer librement les meurtres qui sont le but de sa vie.

Il faut donc avant tout pour arrêter les progrès, pour diminuer les ravages sans cesse croissants de cette maladie si cruelle, se décider à observer ponctuellement toutes les règles que l'hygiène recommande et qui se rapportent plus ou moins, il est vrai, à toutes les maladies contagieuses.

Mais ces mesures acquièrent pour la diphtérie une importance beaucoup plus grande en raison de la résistance particulière que le

bacille de Löffler oppose aux causes vulgaires de destruction des microbes ; ses spores se conservent, pour ainsi dire, à l'infini et, sans les précautions les plus minutieuses, on ne parvient pas à s'en débarrasser.

Le bacille du choléra n'a pas la propriété de s'éterniser dans nos contrées, il y meurt, il s'éteint avec sa descendance ; il est incapable de coloniser chez nous, de s'y établir, de créer des endémies ; si nous le voyons reparaître après un certain nombre d'années, nous pouvons affirmer que de nouveaux sujets ont été apportés de l'Inde.

Pour la diphtérie, qui semble avoir moins préoccupé les autorités sanitaires, il a suffi d'une seule importation, les conditions climatériques et telluriques de nos contrées conviennent admirablement au bacille qui en est l'agent spécifique. Mais quelles sont ces conditions ? Pourquoi voyons-nous aussi la diphtérie continuer ses ravages pendant de longues périodes dans une commune, dans une région, alors que dans certaines localités elle cesse ses ravages après une épidémie qui aura duré quelques mois ?

On l'a dit, la diphtérie est une affection ubiquitaire, elle peut s'implanter partout, quel que soit le sol, le climat, l'altitude, l'exposition, la race d'hommes, mais elle manifeste évidemment des préférences pour certaines localités, pour certains endroits, elle doit y rencontrer des conditions plus favorables à son entretien, à la conservation de ses germes.

Ce sont ces conditions que nous devons chercher à connaître pour les corriger, pour les faire disparaître ; c'est là l'inconnue à la recherche de laquelle nous convie le comité de la première section.

Pour arriver le plus rapidement possible et le plus sûrement à la solution de cette question, nous devons relever les conditions particulières que présentent les localités où se maintiennent plus aisément les bacilles diphtéritiques au point de vue de la configuration du sol, de l'altitude, de l'exposition, de la nature du terrain, de la hauteur de la première nappe d'eau et, ne l'oublions pas, de la propreté de la surface, comparer ensuite ces localités entre elles, voir sur quels points elles présentent des analogies, par quels côtés elles diffèrent ; c'est évidemment du côté des similitudes que doivent se trouver les conditions recherchées par le bacille diphtéritique.

D'autre part, on peut également noter toutes les conditions qui se rencontrent dans les communes où la diphtérie ne parvient pas à se perpétuer, et, en les rapprochant de celles trouvées dans le groupe des localités où cette maladie règne endémiquement, on découvrira des différences qui expliqueront la disparition facile, la stérilisation spontanée des germes diphtéritiques dans les premières, leur entretien, leur réapparition continuelle dans les secondes.

C'est à la statistique que nous devons nous adresser pour découvrir les localités où la diphtérie se plait le mieux ; nous avons établi comme d'autres l'avaient fait, que cette maladie cause plus de décès dans les communes rurales et suburbaines que dans les villes, et pourtant la densité de la population, si favorable à la contagion, est beaucoup plus forte dans les dernières ; à quoi tient donc cette différence d'accueil réservé au bacille diphtéritique ?

Plusieurs circonstances peuvent être invoquées ici ; les poules etant des agents rénovateurs des germes diphtéritiques, ces agents sont évidemment plus nombreux dans les campagnes, et cela suffirait à expliquer les données de la statistique ; mais il existe d'autres différences entre les villes et les communes rurales : le sol est protégé dans les premières par le pavé contre les *souillures de la surface;* cell-ci est en général tenu dans un meilleur état de propreté ; à la campagne, vous connaissez la pratique suivie généralement : la voirie est fort négligée et elle le serait plus encore si le paysan ne trouvait dans les routes pavées un avantage pour ses charois ; dès que se but là est rempli, il se soucie bien peu de l'état de propreté du chemin ; le fumier s'étale et s'amasse devant les habitations, à proximité du puits qui fournit l'eau de boisson ; ni le trou au fumier, ni le puits, ni la fosse d'aisances ne sont cimentés, un commerce illicite s'établit bientôt souterrainement entre les liquides s'échappant par filtration de ces réservoirs, la nappe aquifère est contaminée et c'est dans ce mélange impur que la fièvre typhoïde trouve la condition la plus favorable à son développement. Mais c'est aussi sur ces fumiers qu'on jette le plus souvent les excrétions des malades ; c'est là que les poules vont réveiller les germes diphtéritiques assoupis, et, si les fumiers interviennent dans la conservation de ces germes, on doit nécessairement trouver une sorte de relation entre la marche de la fièvre typhoïde et celle de la diphtérie.

Pour faire cette démonstration, je me suis servi des chiffres relevés par notre vaillant Président, M. le Docteur Kuborn, et j'ai dressé un diagramme représentant la mortalité produite par la fièvre typhoïde et par la dipthérie dans les différentes provinces belges de 1871 à 1880 ; on voit manifestement par là que ces deux affections ont une marche parallèle, que là où l'une fait plus de ravages, l'autre accentue également son action funeste, et *vice-versâ ;* je n'ai trouvé qu'une exception, et c'est bien le cas de dire que l'exception confirme la règle, puisque c'est elle qui vient donner le plus de force à ma démonstration.

Dans la Flandre occidentale, le parallélisme est rompu. Pourquoi ? Quelle différence y a-t-il entre cette province et celles qui l'entourent pour que le bacille diphtéritique y soit moins favorisé dans son séjour ? Cette différence, c'est à la surface que je la trouve, car je constate que cette partie du territoire belge est sillonnée par un bien plus grand nombre de cours d'eau, qui doivent naturellement aider à un entretien plus soigné de la surface du sol. On voit encore par là la distinction qu'il faut faire entre un certain degré d'humidité du sol, favorable aux microbes en général, et un lavage à grandes eaux qui les entraine au loin.

Ce n'est pas d'ailleurs toujours dans les lieux bas et humides que la diphtérie fait le plus de victimes ; j'ai eu l'occasion récemment de fair une remarque que je tiens à rapporter ici : la diphtérie régnait dans trois communes voisines du canton d'Ath, Ostiches, Œudeghien et Mainvault, et dans chacune d'elles c'était dans le hameau le plus élevé que se trouvait le foyer principal, que la diphtérie avait établi son quartier général ; dans ces trois communes le commerce des œufs est très

florissant, tous les habitants ont des poules, les fumiers s'étalent et s'amassent le long des chemins.

Après avoir établi la distribution de la diphtérie dans les différentes provinces, dans les différents cantons, nous pourrons encore trouver des indications précieuses dans l'étude de la marche qu'elle a suivie dans une même localité, dans un même district pendant une longue suite d'années et dans la recherche des causes qui ont pu amener des aggravations à certaines époques des rémissions à d'autres moments; c'est dans ce but que j'ai dressé la marche de la diphtérie en Belgique de 1851 à 1889.

Enfin, nous pouvons également comparer cette marche dans différents lieux plus ou moins voisins, et chercher à découvrir pourquoi la diphtérie faisait ici plus de ravages, alors que dans une autre localité elle semblait se calmer, ralentir ses coups; on voit en effet de grandes différences dans la marche suivie par la diphtérie aux mêmes époques dans les différentes localités; j'ai pu m'en assurer en dressant le diagramme qui représente la marche de la diphtérie dans la ville de Paris —de 1872 à 1887—d'après les chiffres de M. Jacques Bertillon; on peut ainsi voir clairement qu'il n'y aucune coïncidence dans l'élévation et l'abaissement de la mortalité pour cette ville et pour la Belgique; ils s'agira toujours de rechercher ensuite à quelles causes il faut attribuer ces variations dans les différents lieux, dans le même temps; ces causes doivent avoir évidemment surtout un caractère local.

Mais il est temps que je m'arrête dans l'exposé du plan des recherches à instituer pour arriver à mieux connaître les conditions qui plaisent le mieux au bacille de Löffler et que nous devrons pour cette raison empêcher de se produire; en attendant, les remarques que nous avons pu faires nous font désirer vivement voir les autorités veiller avec toute l'énergie possible à empêcher les souillures de la surface du sol; le Ministre de l'Agriculture, de l'Industrie et des Travaux publics de Belgique a cru devoir adresser le 30 Décembre dernier à Messieurs les Gouverneurs une circulaire tendant à appeler l'attention des communes sur la réglementation des fosses d'aisances, à purin et à fumier; c'est bien selon nous dans cette voie qu'il faut marcher; mais il ne suffit pas malheureusement d'exprimer un désir; les conseils, tout sensés qu'ils puissent être, ne parviendront pas à vaincre la résistance opiniâtre que le paysan oppose à toute innovation, aussi nous espérons que l'autorité convaincue de l'importance du but à atteindre, de la nécessité de faire disparaître une disposition si favorable aux germes morbides les plus malfaisants, ne tardera pas à exiger ce qu'elle ne pourra pas obtenir par voie de conseils; le médecin prescrit pour combattre le mal, l'hygiène doit également prescrire les mesures propres à le prévenir, et personne n'a le droit de se soustraire aux obligations qu'elle impose.

Ville de Paris.—Marche de la diphtérie de 1872 à 1887.

Mortalité par 100,000 *Habitants.*

1872 -	- 62·0	1880 -	- 98·7
1873 -	- 63·9	1881 -	- 103·8
1874 -	- 52·7	1882 -	- 106·4
1875 -	- 66·6	1883 -	- 87·7
1876 -	- 79·1	1884 -	- 93·9
1877 -	- 121·3	1885 -	- 79·7
1878 -	- 93·0	1886 -	- 73·4
1879 -	- 84·4	1887 -	- 78·2

Mortalité comparée par Diphtérie et par Fièvre typhoïde, dans les difféerentes Provinces belges, la Flandre orientale exceptée, de 1871 à 1880.

Provinces.	Mortalité par Diphtérie; décès par 100,000 Habitants.	Mortalité par Fièvre Typhoïde; décès par 100,000 Habitants.
Anvers - - - -	66·6	87·0
Brabant - - - -	68·5	68·5
Flandre occidentale - -	139·0	95·0
Hainaut - - - -	88·7	75·0
Liège - - - -	82·0	72·1
Limbourg - - - -	106·7	86·8
Luxembourg - - -	95·0	76·3
Hamur - - - -	61·0	64·0
le Royaume - - -	88·8	76·4

Diphtérie.—Sa Marche en Belgique de 1851 à 1890.

Mortalité annuelle par Diphtérie; décès par 100,000 *Habitants.*

Années.	Décès par Diphtérie.	Mortalité par Diphtérie; décès par 100,000 Habitants.	Années.	Décès par Diphtérie.	Mortalité par Diphtérie décès par 100,000 Habitants.
1851	1,429	32·1	1871	8,683	170·2
1852	1,479	32·9	1872	5,056	98·2
1853	1,528	33·7	1873	4,790	91·6
1854	2,055	44·9	1874	4,766	90·0
1855	2,489	54·3	1875	5,512	102·6
1856	2,260	49·4	1876	4.655	86·6
1857	3,039	66·7	1877	4,210	78·3
1858	3,484	75·7	1878	4,259	78·2
1859	3,498	75·2	1879	4,199	76·2
1860	2,887	61·4	1880	4,481	81·0
1861	4.087	85·9	1881	4,016	72·3
1862	4,468	92·9	1882	4,184	74·4
1863	6,111	129·9	1883	4,244	74·6
1864	6,852	139·9	1884	4,898	85·5
1865	7,587	152·8	1885	5,092	87·5
1866	5,825	118·2	1886	5,425	92·2
1867	3,965	83·6	1887	3,998	67·2
1868	3,928	79·6	1888	3,586	59·7
1869	3,659	69·3	1889	3,279	54·0
1870	5,e43	115·2	1890	3,433	56·1

Diphtheria in Minnesota.

BY

CHARLES N. HEWITT, M.D., Secretary and Executive Officer of the State Board of Health of Minnesota, U.S.A.

Minnesota, one of the United States, was admitted to Statehood in 1858, 35 years ago, with a population of about 50,000 people. First settled by hardy pioneers from the more eastern States of the Union, it now has a population of 1,302,000. The State is located in the geographical centre of North American continent, at an average elevation of about 1,000 feet above the sea, between the 42nd and 48th parallels of latitude, and the 90th and 97th parallels of longitude. Its area is 84,286 square miles or 54,000,000 acres, of which not far from one eighteenth is water, in the form of thousands of ponds and lakes. The height of land is in the north-west section, where the Mississippi takes its rise. This river flows diagonally through the State from N.W. to S.E., and forms a portion of its eastern boundary. Most of the other streams south of its origin are tributary to the great river. To the north and west of the height of land, the streams are tributary to the Red River of the North, which flows north to Lake Winnipeg, in the Canadian province of Manitoba.

The natural water-supply and drainage of the whole State are above the average, and the river supply is supplemented by springs and wells. Most of the wells are deep, and many are artesian, and some of the last are flowing wells. The soil is chiefly alluvial, broad prairie, alternating with rolling and timber land. Many cities and villages have a public water supply.

Distribution of the population.—Thirty per cent. live in cities of over 5,000 inhabitants, and 70 per cent. in villages and townships. The occupation of the people is chiefly agricultural, in the cultivation of wheat and other grains, and the breeding of horses, cattle, and sheep. Lumbering and iron-mining are large industries in the north-east portion of the State. In the villages and cities, besides the usual business of all centres of population, are great industries for the manufacture of flour, lumber, iron, agricultural machinery, dressed meats, pottery, &c. St. Paul and Minneapolis, immediate neighbours, with an aggregate population of 300,000, are already confronted by, and vigorously dealing with, the sanitary questions common to great active and growing cities.

Something over 4,000 miles of railroad and telegraph lines bring almost every family of the State into easy reach of facilities for travel, mail, and telegram.

As to climate.—The seasonal averages of the last five years are:— Spring, 41° 4′ F.; Summer, 67° 6′ F.; Fall, 43° F.; Winter, 9° 4′ F. Spring opens up promptly, and vegetation springs rapidly into full

activity. Summer is, as a rule, hot, with many comfortable days and cool nights. Fall is our most delightful season, and often holds on with with beautiful and bright days and comfortable temperature till the 15th of November, when winter usually sets in, and the weather is cold and steady, with a little January thaw, till April. Our snowfall is less than in States farther east.

Birth-rate and Mortality.—Premising that the statistics of births are much below the fact in new countries, even more than in old, the following are the returns for the last three years :—In 1888 there were 27·45 births and 12·42 deaths to 1,000 persons living ; in 1889 there were 25·18 births and 11·80 deaths to 1,000 persons living; in 1890 there were 23·10 births and 11·00 deaths to 1,000 persons living. The proportion of births is below the truth, while the rate of mortality is nearly exact.

In the combined population of the adjacent cities, St. Paul and Minneapolis (average of three years 1888–90), the deaths were 16 in 1,000 living.

In order of mortality diphtheria stands third, and is exceeded only by tuberculosis and diarrhœa of children.

This paper is founded chiefly upon the statistics and experience of the last four years (1887–88–89–90), during which time the collection of vital statistics, by monthly returns, has been the duty of health officers, clerks of townships, and the secretary of the State Board of Health. So far as possible, I have added the experience of medical men, and my own for the last 18 years, during which time I have been officially concerned with the local boards of health, in the control of every important outbreak of diphtheria which has occurred.

In collecting the statistics and history of the deaths here recorded, I have had the kind and hearty co-operation of most of the attending physicians and the health officers, so that, so far as possible, every essential fact known to them has been recorded. I beg, therefore, to attribute to their co-operation most of the value which this contribution to the study of diphtheria may have.

The earliest records of diphtheria in Minnesota date before 1860, when it appeared in the families of settlers in the valley of our great rivers, as a severe and often malignant tonsillitis, with much glandular enlargement, and severe systemic disturbance. It was often mistaken for scarlatina anginosa. From the low lands it spread to the high lands, following the border of the forest, and thence to the prairie, till it invaded nearly every inhabited section of the State. It was fatal, usually, by systemic poisoning, and the croupous variety does not seem to have been so common as now. At first, and until about 1884, outbreaks so extended as to embrace several townships were not unusual. Since then, and coincident with the increasing strictness of the isolation of its victims, their nurses and homes, the disease has what we call a *family prevalence*, being largely confined to the family first affected, or to families directly associated.

Seasonal prevalence.—The maxima occur in October declining gradually to July, which is the minimum, whence the rise begins. This

is the average of four years, but the monthly prevalence for each year varies, as will be seen by consulting the Table No. I. I have appended to this chart the same date for croup, to permit of a comparison of the two affections so often confounded, and so often coincident, if not identical (*see* Table II.) that our rule is to isolate croup as diphtheria until proven not to be, reversing the rules of evidence in the interest of other children who have repeatedly been infected by patients in whom laryngeal diphtheria was mistaken for the false or real croup.

The October increase in morbidity and mortality is so invariable that it is customary, in my office, to forestall its occurrence by calling the attention of the local boards of health to the probability, and by an increased popular distribution of our tract on the disease. In seasonal prevalence, diphtheria very closely resembles enteric (typhoid) fever. (*See* Table No. III.)

Mortality by sex.—In the average of the four years, the relative mortality for all ages differs very little—49·92 per cent. males, 50·08 per cent. females—but by periods of age the difference is very marked.

——	Males.	Females.
Under 5 years of age - - -	53·00 per cent.	47·00 per cent.
Between 5 and 10 years - - -	47·00 „	53·00 „
„ 10 „ 15 „ - - -	35·00 „	65·00 „
„ 15 „ 20 „ - - -	51·37 „	48·63 „
„ 20 „ 30 „ - - -	36·9 „	63·1 „

In the four years there were 43 deaths from this cause in persons over 30 years of age or of unknown age.

According to the Census of 1890, 56 per cent. of the population of Minnesota are foreign-born.

Nativity of the dead.—In the average of four years—

49 per cent. were born where they died.

24 per cent. were born elsewhere in Minnesota.

14 per cent. were born in other of the United States.

7 per cent. were born in other countries

Parent nativity.—In the average of four years—

63·6 per cent. of the dead had both parents foreign.

19·8 per cent. had both parents American.

3·8 per cent. had an American father and a foreign mother.

8·3 per cent. had foreign father and American mother.

Ages of the dead.—In the average of four years—

4·39 per cent. of the dead were under 1 year of age.

7·80 per cent. of the dead were between 1 and 2 years of age.

10·16 per cent. of the dead were between 2 and 3 years of age.

10·77 per cent. of the dead were between 3 and 4 years of age.

10·53 per cent. of the dead were between 4 and 5 years of age.

44·58 per cent. were under five years of age.

34·63 per cent. were between 5 and 10 years of age.

13·04 per cent. were between 10 and 15 years of age.
4·41 per cent. were between 15 and 20 years of age.
1·96 per cent. were between 20 and 30 years of age.

Relative mortality in city and country.

——	Per centage of total deaths from all causes.	
	1888.	1889.
Cities of over 100,000 population - -	4·12 per cent.	6·38 per cent.
Cities of between 15,000 and 35,000 population - - - - - -	4·10 „	1·28 „
Cities over 5,000 and less than 15,000 population - - - -	4·15 „	6·63 „
Village and country population (Centres less than 5,000) - - -	7·14 „	5·93 „

The city population represents about 400,000 of the inhabitants of the State, or 30 per cent., while the village and country population constitute 70 per cent. It seems fair to conclude from the evidence at hand, that the disease is diminishing in the country but not in the city. What I have called "the family prevalence" of diphtheria in Minnesota, is so marked a feature of its distribution, that I have arranged to study it in that way. Out of a great collection of data, which is accumulating because of the obligatory notification of infectious disease, and the voluntary contribution of the history of outbreaks by medical men, a more intimate knowledge of its character is likely to come. For example, I have the record of 1893 families in which diphtheria occurred in 1888–89–90. In 17·6 per cent. of these more than one death occurred. Among these last there was an average of 2·43 per cent. deaths in each family. Seven pairs of twins in as many families died nearly at the same time. Inquiring as to the influence of *sex on mortality* where there were plural deaths in one family, I find little difference. 50·43 per cent. of the dead were males and 49·57 per cent. females. The *mortality by age* was, under 1 year, 2·9 per cent.; between 1 and 2, 7·2 per cent.; between 2 and 3, 10·8 per cent.; between 3 and 4, 8·9 per cent.; between 4 and 5, 11·9 per cent.; under 5 years, 41·7; between 5 and 10, 38·2; between 10 and 15, 15·6; between 15 and 20, 4·9; 20 to 30, 1·5 per cent. The *parent nativity* of this class was as follows:—Both parents American, 17·0 per cent.; both foreign, 65·0 per cent.; American father, foreign mother, 6·8 per cent.; foreign father, American mother, 8·3 per cent.

General conclusions.—For the direction of our every-day work in the effort to reduce the sickness and death-rate from this disease, our provisional conclusions are as follows:—1. That diphtheria is chief among the preventable diseases of infancy and childhood. 2. That the infection of diphtheria lives and grows, outside the body, both above and below its temperature. 3. That this infection is obstinate and persistent in damp and dark houses or places. 4. That it is preserved for an indefinite time dried upon clothing, bedding, and the like, in trunks and closets. 5. That to the strict isolation of both sick and their attendants should be united constant with careful cleanliness of persons and things,

ventilation and exposure to sunlight of clothing, bedding, and other contents of the room, with persistent use of fire and boiling water for the destruction or disinfection of all infected things. 6. That personal isolation and disinfection of the sick of diphtheria should be continued for at least three weeks after apparent recovery. 7. That despite the most painstaking and approved disinfection and ventilation of rooms which have been occupied by the sick of diphtheria, it is unsafe to permit healthy children to live or sleep in such rooms until as long a time as possible has passed, with repeated disinfection and ventilation. A period of three months with the use of the above measures has failed to protect healthy children from the infection, in otherwise healthy houses, who have returned with no other known exposure than they found there. 8. That in the country, or elsewhere, when an isolation hospital is not available, our rule is, if possible, to remove the healthy children from infected families to other families where there are none, or only grown-up children. Thus, the infected house becomes a hospital, the mother has only the sick to care for, the well children have no further or other exposure, and the result is almost constantly to restrict the disease to the first, or at farthest two, of even large families. The morbidity and mortality of diphtheria have decreased decidedly since the measures above noted have been in use in Minnesota, as the following statistics show:—The total mortality from this cause, in terms of years, was in 1883, 1,347; in 1884, 1,211; in 1885, 1,138; in 1887, 788; in 1888, 866; in 1889, 889; in 1890, 772. It must be constantly borne in mind that the population has been increasing very rapidly during all these years, both by excess of births over deaths and much more by immigration. 9. Despite encouraging gain in so many ways, the battle with diphtheria is not half won, but will be more and more difficult. Therefore every outbreak should be made to yield all the facts possible as to its natural history and other essential data. This can be done while using, for all we can get out of them, the means at present available, so carefully and thoroughly that no opportunity be lost for simplifying their character or increasing their efficiency.

VITAL STATISTICS.—MINNESOTA STATE BOARD OF HEALTH.

TABLE I.

MORTALITY from DIPHTHERIA by Months, 1887–90.

—	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1887 - -	59	48	28	30	35	62	34	63	83	100	110	136
1888 - -	117	73	55	64	47	44	52	59	69	100	93	93
1889 - -	80	75	86	81	80	64	31	41	41	117	111	82
1890 - -	79	54	59	54	55	48	52	47	55	100	86	83
Total -	335	250	228	229	217	218	169	210	248	417	400	394
Average of 4 years -	84	62	57	57	54	55	42	52	62	84	100	98

PER CENT. of DEATHS from this cause.

—	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1887 - -	7·48	6·05	3·55	3·81	4·44	7·86	4·31	7·99	10·51	12·81	13·95	17·26
1888 - -	13·51	8·43	6·35	7·39	5·43	5·08	6·00	6·81	7·97	11·55	10·74	10·74
1889 - -	9·00	8·44	9·67	9·11	9·00	7·20	3·49	4·61	4·61	13·16	12·49	9·22
1890 - -	10·23	7·0	7·64	7·0	7·12	6·22	6·74	6·09	7·12	11·65	11·14	10·75
Average of 4 years -	9·9	7·6	6·9	6·8	6·5	6·6	4·9	6·5	7·5	12·4	11·9	11·8

Spring, 19·9 per cent. Summer, 18·27 per cent. Autumn, 31·9 per cent. Winter, 29·5 per cent.

TABLE II.

MORTALITY from CROUP by Months, 1887–90.

—	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1887 - -	18	21	13	23	7	10	16	14	27	48	43	43
1888 - -	21	27	24	19	17	9	8	11	13	21	24	31
1889 - -	26	34	26	24	13	5	9	12	16	34	34	35
1890 - -	23	13	20	6	18	11	11	7	17	18	26	35
Total -	88	95	83	72	55	35	44	44	73	121	127	144
Average of 4 years -	22	24	21	18	14	9	11	11	18	30	32	36

PER CENT. of DEATHS from this cause.

—	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1887 - -	6·37	7·42	4·59	8·12	2·47	3·53	5·66	4·95	9·54	16·96	15·19	15·19
1888 - -	9·34	12·0	10·67	8·45	7·56	4·00	3·50	4·89	5·78	9·34	10·67	13·78
1889 - -	9·70	12·68	9·70	8·95	4·85	1·87	3·36	4·48	5·97	12·69	12·69	13·06
1890 - -	11·22	6·34	9·27	2·92	8·78	5·37	5·37	3·41	8·29	8·78	12·68	17·07
Average of 4 years -	8·94	9·76	8·54	7·32	5·69	3·66	4·88	4·88	7·32	12·23	13·01	14·63

Spring, 21·55 per cent. Summer, 13·42 per cent. Autumn, 32·56 per cent. Winter, 33·33 per cent.

TABLE III.

ENTERIC FEVER, 1887–90.

—	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Average of 4 years -	46	27	28	25	22	25	25	64	94	111	71	57
Per cent. -	7·77	4·56	4·73	4·22	3·72	4·22	4·22	10·81	15·88	18·75	11·99	9·12

Spring, 12·67 per cent. Summer, 19·25 per cent. Autumn, 46·62 per cent. Winter, 21·45 per cent.

Note sur la Prophylaxie de la Diphtérie.

PAR

le Dr. J. Bergeron, Paris.

En demandant à être inscrit pour faire, au Congrès, une communication sur la Diphtérie, je n'ai pas eu la prétention d'apporter ici des faits bien nouveaux; mon but a été simplement de faire connaître d'abord, par l'exposé de données statistiques recueillies en France, les progrès interrompus qu'y a faits la Diphtérie, depuis un certain nombre d'années; puis, de provoquer, de la part de nos honorables confrères des autres pays, la communication de documents du même genre; mais mon but a été surtout d'obtenir, par suite de ces communications et des discussions qu'elles pourront faire naître, des données vraiment scientifiques sur les mesures de prophylaxie propres à enrayer la marche envahissante de cette redoutable maladie.

Il serait, à coup sûr, fort intéressant de faire remonter le plus haut possible, dans le passé, la recherche de l'acte de naissance de la Diphtérie et par suite celle de son origine, ainsi que n'ont pas manqué de le faire la plupart des auteurs qui ont traité de cette terrible maladie; les uns s'étant efforcés de prouver qu'elle était connue des médecins de l'antiquité, quelques-uns même, de nos jours, ayant densé sur la foi de Littré, qu'Hippocrate l'a décrite; d'autres, au contrarie, tels que Home et Bretonneau, ayant cru l'avoir décrite pour la première fois et pour ainsi dire découverte.

Mais il y a quelques raisons pour que de pareilles recherches restent toujours stériles. La plus sérieuse est que, pour les siècles passés, et pour la première moitié de celui-ci, les statistiques manquent complètement; puis, qu'à leur défaut, pour trouver, dans les relations d'épidémies d'angines malignes laissées par les auteurs, quelques données sur l'origine et la marche de la Diphtérie, il faudrait avoir au moins quelque certitude sur l'unité de la maladie décrite sous les noms les plus divers; et le doute est ici d'autant plus légitime que, Bretonneau lui-même, a commis la plus étrange confusion entre la Diphtérie, et une maladie, autre fois endémique dans plusieurs armées de l'Europe, je veux parler de la Stomatite ulcéreuse.

Or, si Bretonneau et ses élèvès ont ainsi confondu deux affections aussi complètement dissemblables, est-il vraisemblable qu'Arétée, Celse, Aetius, Carnevale, Bartholin, Midleton, Marteau, Home, j'en passe et des plus intéresants, aient uniquement décrit des épidémies de Diphtérie, sous les noms d'*angine maligne* d'*angine gangreneuse*, de *fégarite*, de *stomacace* et de *garotillo*.

Quant à moi, il ne me répugnerait pas absolument d'admettre que quelques-unes de ces dénominations ne s'appliquaient qu'à une seule maladie, et que le plus grand nombre d'épidémies de maux de gorge rapportées par les auteurs étaient en effet des épidémies de Diphtérie, si je ne constatais cette différence capitale que la maladie, après avoir

exercé des ravages plus ou moins terribles, ne paraît s'être implantée, à l'état endémo-épidémique, dans aucun des pays qu'elle avait envahis, contrairement à ce que nous observons, depuis quarantc ans, en Europe, où elle a pris place dans les tableaux mortuaires de toutes les grandes villes, en s'y maintenant avec des chiffres presque toujours croissants.

En résumé, nous ne savons rien des origines de la Diphtérie, et la Section ayant mieux à faire qu'à s'occuper de cette question d'histoire, je passe aux faits.

Les tableaux que je fais passer sous les yeux de la Section, montrent de la manière la plus saisissante que dans les cinq plus grandes villes de France, la Diphtérie est devenue endémique, depuis un tiers de siècle au moins, et n'a cessé d'y faire des progrès à peine retardés de loin en loin par une diminution momentanée de la morbidité et de la mortalité, telle qu'on l'observe invariablement, pour toutes les maladies infectieuses, à la suite d'épidémies exceptionnellment meurtrières, auxquelles n'a échappé aucune réceptivité.

En ce qui concerne Paris, je n'ai pu trouver de relevés statistiques sérieux avant ceux qui ont été publiés par mon honorable collègue M. le Dr. Besnier, à partir de 1865, et qui d'ailleurs ne comprennent que les cas et les décès constatés dans les hôpitaux. Mais à défaut de statistiques, tous les praticiens parvenus, comme moi, à un âge très avancé, trouvent dans leurs souvenirs des preuves absolument convaincantes des progrès continus de la maladie.

Pour ma part, lorsque je compare la rareté des cas de croup et d'angine diphtérique que j'observais à l'hôpital des Enfants, pendant mon internat, en 1844, à la multiplicité de ceux que j'ai trouvés dans mes salles lorsqu'en 1858, j'ai pris le service de l'hôpital Sainte-Eugénie ; lorsque je la compare surtout à l'effrayante mortalité de ces dernières années, je ne pourrais me défendre d'un sentiment de crainte pour l'avenir, si je n'avais foi dans les destinées de l'hygiène, si je n'avais même l'espoir que de vos délibérations sortiront des données rassurantes.

Vous voyez qu'à Lyon, la progression, pour avoir été moins constante et moins rapide qu'a Paris, n'en a pas moins atteint en 1889 ot 1890, un taux vraiment inquiétant, et si le relevé des quatre premiers mois de 1891 semble faire prévoir que, cette année, à Lyon, la Diphtérie sera moins fréquente et moins meurtrière, peut-être ne faut-il voir là que le temps d'arrêt qui suit invariablement toutes les grandes épidémies.

A Marseille, comme à Lyon, même marche ascendante et aboutissant en 1890, après des oscillations bien peu accusées, au chiffre énorme dc 675 décès diphtériques.

Il est évident qu'à Bordeaux, les progrès de la Diphtérie n'ont été, pendant les dix dernières années, ni constants, ni très accusés, et qu'en résumé, la population de cette grande cité a été relativement épargnée.

A Lille, la situation est plus grave, non pas seulement parce qu'avec une population sensiblement moins élevée que celle de Bordeaux.

on y a constaté en 1889 un nombre de décès diphtériques presqu'aussi élevé que dans cette dernière ville, mais surtout parce que, depuis 1878, la progression de la mortalité diphtérique a été constante.

Je n'ai parlé que de nos cinq plus grands centres de population, mais il suffit de jeter un coup d'œil sur *la statistique sanitaire* des villes de France et d'Algérie, publiée par la Direction de l'hygiène publique, pour constater qu'il n'est pas une seule de nos villes, pour ainsi dire, qui ne paie chaque année un tribut plus ou moins lourd à la Diphtérie, de sorte qu'on peut dire sans exagération que depuis quelques années, la Diphtérie fait, par an, plus de cinq mille victimes en France. Le fait est hors de doute au moins pour les années 1886, 1887 et 1888 ; en effet, pendant cette période triennale, les 195 villes qui adressent au ministère de l'intérieur leur statistique mortuaire, ont compté 16,427 décès diphtériques, dépassant ainsi de 1,130 le nombre des décès typhoïques. Je ne sais quelles conclusions on pourra tirer des statistiques qui seront produites ici par nos honorables confrères mais il y en a une qui ressort avec la plus douloureuse évidence de la nôtre : c'est que la Diphtérie est devenue en France, une véritable calamité publique devant laquelle les hygiénistes ont le devoir de se mettre à l'œuvre pour éclairer les populations et les pouvoirs publics sur les moyens d'en atténuer les désastreux effets.

A quelles causes faut-il attributer les progrès incessants de l'endémo épidémie diphtérique ? La nature de la maladie s'est-elle modifiée ? Avait-elle autrefois un caractère de septicité moins prononcé et par suite une moindre force d'expansion ? On est tenté de le croire, quand on songe que, dans le passé, et dans un passé encore bien peu éloigné de nous, les mesures de prophylaxie étaient à peu près nulles. Mais, n'est-il pas plus vraisemblale que ce qui a surtout favorisé la propagation de la Diphtérie, en dehors de la famille, c'est la multiplicité croissante des communications, à la crèche, au nurseries, aux asiles maternels, aux squares, danss le voitures publiques et surtout à l'école.

La clinique n'avait pas attendu la découverte du bacille de Klebs (1883) pour admette la spécificité et la contagiosite de la Diphtérie, qu'avaient depuis longtemps proclamées Bretonneau et Trousseau. Mais cette découverte, confirmée depuis par Lœffler (1884) et surtout par les intéressantes recherches de Roux et Yersin (1889), a certainement contributé, en montrant le corps du délit, à faire attacher plus d'importance que par le passé aux mesures de prophylaxie et à inspirer plus de confiance dans l'efficacité de ces mesures ; enfin, la démonstration plus récente de la localisation du bacille de la Diphtérie exclusivement dans les fausses membranes, et à coup sûr aussi, dans la sérosité jaune rosé qui s'écoule du nez, ou des paupières dans la Diphtérie palpébrale, cette démonstration, dis-je, a eu ce double effet de donner à la thérapeutique une direction plus rationelle et de fournir à la prophylaxie de précieuses indications.

Donc, la Diphtérie est spécifique et transmissible, et comme nous ne savons encore rien de son origine, nous ne pouvons la ranger près de ces deux grandes maladies infectieuses, la *variole* et la *fièvre typhoïde*,

que M. Brouardel a justement appelées des *maladies évitables* et qui le sont en effet, ainsi que l'ont prouvé l'Angleterre et l'Allemagne pour la variole, ainsi que la France, j'en ai le ferme espoir, le prouvera bientôt aussi, pour la même maladie, et ainsi que notre honorable Président l'a bien montré pour la fièvre typhoïde.

En effet si le vaccin et la pureté des eaux d'alimentation nous donnent une garantie assurée contre la variole et le typhus abdominal, il n'en est pas de même pour la Diphtérie que nous ne pouvons atteindre dans son origine et contre laquelle nous n'avons pas de liquide vaccitant. De sorte que, pour diminuer ses ravages, nous en sommes réduits à l'emploi de deux mesures, applicables d'ailleurs à toutes les maladies transmissibles, à savoir la *désinfection* et l'*isolement*.

Je serai bref au sujet de la désinfection, car la pratique de cette opération ne présente rien de spécial pour la Diphtérie, pas plus qu'elle n'exige d'autres agents de désinfection, que ceux qui sont partout en usage ; mais ce qu'il ne faut pas oublier, c'est qu'il n'est peut-être pas de germes contagieux dont elle puisse aussi bien assurer la destruction que ceux de la Diphtérie, parce que c'est dans les fausses membranes qu'elle est sûre de les trouver et de pouvoir les atteindre.

On a beaucoup discuté sur le mode le plus probable de transmission de la Diphtérie, mais, pour ma part, je crois surtout, je dirais presque exclusivement à la *contagion directe*, soit par les fausses membranes rejetées par les diphtériques et portées directement sur les muqueuses des personnes saines, soit par le liquide du jetage, soit par des débris pseudo-membraneux frais ou même desséchés, tant paraît être longue, hors de l'organisme, la persistance de la vitalité du bacille, débris qui ont pu rester dans les linges, la literie, les vêtements, les jouets même, enfin sur les parois des logements, où une désinfection mal faite aura été impuissante à les détruire.

En résumé, destruction des fausses membranes *in situ*, désinfection énergique et persévérante de tous les objets qui ont pu être souillés par les produits morbides de la diphtérie, voilà l'indication qui s'impose et qu'il sera toujours assez facile de remplir, au moins dans les villes.

Lorsque, au contraire, il s'agit de pratique l'isolement, l'hygiène se heurte à bien des inconnues et c'est avec juste raison que M. Brouarde a pu dire de la Diphtérie " qu'il n'est pas de maladie épidémique sur laquelle nous possédions, à ce point de vue, moins de renseignements." Qui pourrait, en effet, dire aujourd'hui, avec une certitude absolue, à quelle période du début la Diphtérie est déjà transmissible, pendant combien de temps les malades convalescents peuvent encore transmettre la maladie, et enfin quelle doit être la durée de la quarantaine imposée aux enfants, avec raison réputés suspects parce qu'ils ont été en contact plus ou moins prolongé avec des diphtériques.

Or, j'estime que la Section pourrait se flatter d'avoir fait œuvre vraiment utile, si elle pouvait établir, sur ces divers points, pour la Diphtérie quelques données analogues à celles que nous possédons déjà pour la Rougeole, la Scarlatine et la Variole.

Je n'aurais garde de reprendre et de discuter ici tout ce qui a ete écrit sur la durée probable de la période d'incubation et de la période

prodromique de la Diphtérie. Ce qui importe, pour donner à l'isolement tout son efficacité, c'est de savoir si la maladie est transmissible dès l'apparition de la pellicule blanche qui va devenir l'exsudat pseudo-membraneux.

Pour moi, j'en suis convaincu et c'est cette conviction qui a constamment guidé ma conduite.

Certes je sais que bon nombre de faits de transmission, en apparence très rapide, ne sont que des faits de contagion simultanée, avec une période d'incubation d'une durée très variable suivant les conditions de réceptivité des contagionés. Mais cette cause d'erreur écartée, qui de nous n'a vu des personnes saines de l'entourage du malade, une mère, une servante, n'ayant été exposées à aucun autre contact suspect que celui du diphtérique pris le jour même, présenter des fausses membranes au bout de trente-six ou quarante-huit heures, ce qui, pour le dire en passant, montre combien peut être courte parfois la durée de la période d'incubation.

Tous les médecins savent qu'il est souvent difficile de distinguer, au début d'une angine, si l'exsudat est diphtérique ou simplement de nature herpétique et, dans le doute, je me suis toujours imposé comme règle absolue d'isoler le malade le plus complètement possible, dès que les signes objectifs constatés au pharynx, ou, dans le cas de croupe d'emblée, dès que les symptômes du côté du larynx annoncent l'apparence d'une menace de Diphtérie. Mais s'il est utile de savoir que la maladie est contagieuse tout à fait à son début, il ne l'est pas moins d'être édifié sur la limite extrême de sa transmissibilité. Or, s'il est vrai que le bacile se cantonne exclusivement dans les fausses membranes et dans le liquide du jetage nasal ou oculaire, il semble que tout danger de transmission doit disparaître dès que les tissus atteints sont entièrement débarrassés de ces dangereux produits ; et cependant, il n'est pas rare d'observer des faits de transmission tardive par des sujets chez lesquels, avec un état général parfait la muqueuse bucco-pharyngienne avait repris son aspect normal, comme si quelque bacille égaré s'était caché dans ses papilles ou ses glandes mucipares.

D'où il suit que la durée de l'isolement doit être prolongée au delà de la guérison en apparence la plus parfaite. Mais quelle doit être cette durée ?

C'est là une question dont la solution est d'une importance capitale pour le succès de la prophylaxie.

Pour ma part, j'ai adopté six semaines comme maximum de durée d'isolement parce que je n'ai jamais observé de cas de transmission au delà de cette limite.

C'est, au reste, celle qui est généralement adoptée en France et j'ajoute, en Angleterre, car si nous exigeons quarante jours à partir de l'invasion, en Angleterre, on compte vingt-huit jours à patir de celui où toute sécrétion morbide a disparu.

Ainsi, isolement du malade dès l'apparition de l'exsudat spécifique et prolongation de cet isolement pendant quarante jours telles sont les règles sur lesquelles la discussion peut être ouverte.

Mais en dehors du malade contre lequel il est nécessaire de prendre les sûretés que je viens de dire, il y a toute une catégorie de suspects dont il importe de fixer le sort.

J'appelle suspects les sujets, enfonts ou adultes, qui ont été en contact plus ou moins prolongé et plus ou moins intime avec un diphtérique et qui, par conséquent, peuvent être eux-mêmes atteints plus tard et devenir de nouveaux foyers de propagation.

C'est donc surtout à leur égard qu'il importe d'être fixé sur le maximum de durée de la période d'incubation de la Diphtérie.

L'immense majorité des faits autorise à dire qu'elle est généralement très courte; d'après le professeur Layet, les médecins lui assignent, en Angleterre, une durée de deux à cinq jours; en Allemagne, de deux à sept jours; en France, nous admettons de trois à cinq jours; toutefois, par prudence, on a, presque partout, porté à dix jours la durée de la quarantaine des sujets suspects. Mais ce laps de temps me paraît insuffisant; en effet, il y a des exemples d'incubation prolongée; j'a moi-même, en 1874, observé et publié deux cas très nets d'incubation de quiz jours au moins; aussi ai-je l'habitude d'exiger une quarantain de vingt jours.

Il y a encore une mesure de prophylaxie sur laquelle je serais heureux d'avoir l'avis de nos honorables confrères; je veux parler de la fermeture des écoles en temps d'épidémic de diphtérie ou de toute autre maladie contagieuse. En France, les médecins ne sont pas, sur ce point, tout à fait d'accord. La plupart pensent que la mesure est indispensable et qu'elle constitue l'un des plus sûrs moyens d'arrêter la propagation de la maladie; d'autres croient, au contraire, qu'elle a plus d'inconvénients que d'avantages, au moins dans les campagnes et comme, de parte et d'autre, on produit des arguments sérieux et que je manque d'expérience personnelle sur cette question, je serais heureux que de la discussion pussent sortir des données dont je ne serais peut-être pas seul à profiter.

Un mot encore en terminant.

Un travail récent de M. Monod nous a appris que, grâce à une puissante organisation de ses services sanitares, l'Angleterre a vu sa mortalité générale diminuer, dans la proportion de 3·44 pour 1,000 habitants, pendant la période décennale de 1880 à 1890. C'est là un résultat considérable, très frappant pour la plupart des maladies zymotiques, moins marqué pour la Diphtérie, mais qui l'est encore assez cependant, pour que nous, médecins français, qui constatons au contraire, dans notre pays, un accroissement constant de la mortalité diphtérique, nous désirons connaître l'ensemble des mesures spéciales de prophylaxie qui, en dehors des effets de l'assainissement général du milieu, ont pu amener ce résultat.

Tels sont messieurs, les divers points relatifs à la prophylaxie de a Diphtérie sur lesquels je me suis proposé d'appeler l'attention de la première Section, parce que je pense qu'à côté des grandes questions d'hygiène internationale dont elle doit surtout s'occuper, il y a encore un sérieux intérêt à étudier en commun cette grave question de la

Diphtérie et à lui donner, s'il se peut, une solution qui nous donne l'espoir de sauver, dans chacun des États réprésentés ici, des milliers de vies humaines.

DISCUSSION.

Professeur Dr. Félix, (Bucarest) said :—Mes honorables collègues ont parlé sur l'isolement et sur la désinfection, mais ils n'ont pas fixé le temps nécessaire pour l'isolement.

Nous savons aujourd'hui que le bacille de la diphthérie conserve dans la bouche sa vitalité, sa force infectieuse, encore quelques semaines après la guérison du malade. Il est donc nécessaire que la désinfection de la bouche soit répétée, que l'isolement soit prolongé pendant quelques semaines après la guérison. Nous possédons deux désinfectants sûrs pour la bouche, c'est l'acide citrique et l'acide lactique dans la concentration d'1 °/₀.

De la Diphtérie au Hâvre, 1880–1889.

PAR

le Dr. Gibert, Hâvre.

Le Bureau d'Hygiène du Hâvre, au nom du quel et de son directeur, mon ami le Dr. Launay, je prends la parole, a une existence de 12 ans, et vous allez voir que son œuvre bien qu'insuffisante et incomplète, justifie sa création.

La diphtérie n'existe officiellement en quelque sorte, au Hâvre, que depuis 1855. Ce n'est qu'en 1859 qu'eut lieu la première trachéotomie. Je pratiquai la seconde en 1860.

Le foyer d'origine de la maladie est le quartier de Graville, que je vous montre sur la carte teinte, en noir, et qui n'a jamais cessé depuis 30 ans, d'avoir le plus grand nombre des cas de décès.

De Graville, la maladie s'est étendue sur toute la ville, ne respectant aucune quartier pas même celui de la côte d'Imgueville où en 1864, il y eut une épidémie très sérieuse bien que limitée.

La statistique que je vous présente embrasse les dix années d'existence du Bureau d'Hygiène, et est par conséquent basée sur des chiffres certains, qui ne comportent aucune erreur.

Elle comprend tous les cas de décès exclusivement, et non pas l'ensemble des cas observés, et cela, parce qu'il n'y a qu'un certain nombre de médecins qui consentent à signaler les cas de maladies contagieuses survenues dans leur clientèle au Bureau d'Hygiène. Nous estimons à $\frac{1}{5}$ le nombre des médecins qui s'y refusent systématiquement.

Je vais examiner successivement la marche de la maladie, sa distribution géographique, son intensité graduellement augmentante jusqu'au 1885, époque où une barrière lui fût enfin opposée.

Marche de la Maladie et Mode de Propagation.

Depuis bien des années, depuis que je suis médecin des épidémies, la diphtérie attaque tous les quartiers de la ville tout en gardant une prédilectiou marquée pour celui de Graville.

Son mode de propagation est bien difficile à préciser, car dans une grande ville, les éléments de contagion sont trop complexes, trop enbrouillés pour pouvoir être suivis. Ce sont les médecins de campagne qui peuvent nous renseigner à cet égard, beaucoup mieux que ceux des villes. Néamoins, il ressort de l'examen d'un grand nombre de cas, que la contagion se fait par les logements infectés, et par le linge, plus que par les personnes. Ce fait, comme nous le verrons étant bien établi, a servi au Bureau d'Hygiène pour combattre la maladie à partir de 1885.

La *distribution géographique* de la diphtérie dans les différents quartiers comporte des remarques très intéresssantes. A Graville même, les quatre quartiers secondaires (ceux adoptés par le recensement) ne comportent que des différences insignificantes, 12·66, 12·47, 11·31, 11·33.

La vieille ville, avec les quartiers de Nôtre Damc et de Saint-François, et celui du Perrey comporta ensuite les chiffres les plus élevés de 9·88, 8·12, 7·95, 7·93.

Tout le bas de la côte, en suivant de grande rue Thiers, la rue d'Etretat et les 4 chemins, est envahi par une mortalité diphtéritiquc encore très-élevée, ainsi que la bande de rues qui avoisine Graville, 8·89 7·85, 6·99, 6·81.

Tout le centre de la ville est relativement très-épargné, puisque la mortalité y descend à 5·15, 4·77, 3·24.

Si nous cherchons à nous rendre compte de ces énormes différences, nous pourvons lc faire en nous servant de la statistique par *rues* qui a été dressée par le Bureau d'Hygiène.

Les grandes rues où le vent souffle de la mer, sont indemnes. C'est ainsi qu'en 10 ans, les grands boulevards François I. et de Strasbourg n'ont pas un seul cas de diphtérie. De même pour la rue Jules le Cesue, et, si le quartier très populeux et très pauvre du Perrey paraît faire exception puisqu'il est frappé gravement, bien que riverain de la mer, c'est que comme on peut le voir sur la carte, il est composé d'un enclevètrement de petites rues, et que pas une seule grande rue n'y donne accès à cette puissance d'assainissement que possède le vent de la mer.

Il ressort donc de cette étude, que la densité de la population, que la contagion d'étages à étages, est le grand élément de propagation de la diphtérie, et que partout où circulent l'air et la lumière, comme dans les quartiers autour de l'hôtel de ville, la diphtérie y est incomparablement moins grave.

Ces remarques revèlent un caractère encore plus grand de vérité quand on compare l'influence des maisons phalanstériennes, cités ouvrières comme à Mulhouse à maisons séparées.

Pendant que la cité hanaise ne perdait en 10 ans que 3 diphthérites sur 350 habitants la caserne des duranes qui contient 1,700 habitants, en perd 22. Ce chiffre de 22 à la caserne est plus élevé que celui des hôpitaux qui n'en perdait que 18 pendant le même espace de temps.

Enfin il y a des rues, en petit nombre, qui sont frappées tous les ans, sans aucune interruption. Elles appartiennent toutes au quartier de Graville. Ce sont les rues Demidoff, Hélène, Jéna, Lefèvreville, Normandie, Cours de la République.

Dans la vieille ville, deux rues seulement présentent la même particularité les rues Royale et du Perrey.

Causes spéciales de la Maladie.

Il a paru évident au Dr. Launay, directeur du Bureau d'Hygiène, que la cause efficace de la prédilection de la diphtérie pour le quartier de Graville, c'était l'état déplorable de la voirie.

La commune de Gravilles fût annexée au Hâvre en 1855, et ce fût une lourde charge pour le Hâvre. Ce ne fût que peu à peu, lentement, qu'on pût drainer les rues, les paver, les entretenir. Pendant de longues années, la seule voirie était le tout au ruisseau, et la couche d'argile qui occupe le sous sol de tout ce quartier le rendait particulièrement humide. Ajoutez à ces causes déja redoutables, des dépôts de fumier qu'on n'a pu faire disparaître que très lentement; et vous aurez, je crois, la cause réelle de la gravité de la maladie dans ce quartier.

Le quartier de l'Eure, encore plus humide, et moins draîné que celui de Graville, malgré le peu de densité de sa population, comporte également et pour les mêmes causes un chiffre élevé de décès, 9·70.

Intensité de la Maladie.

L'intensité croissante de la diphthérite au Hâvre est un fait bien digne d'attention; tant que la maladie n'a rencontré d'obstacles que ceux que lui opposaient les médecins de clientèle, quels que fussent d'ailleurs leur zèle et leur dévouement quelques prescriptions sanitaires qu'ils recommandassent, elle n'a fait que s'étendre en surface et en intensité. De Graville, comme je l'ai dit, la maladie s'est graduellement étendue à toute la ville, et elle a fait des progrès vraiment effrayants d'année en année:

En 1880	-	86 décès.
„ 1881	-	142 „
„ 1882	-	176 „
„ 1883	-	112 „
„ 1884	-	105 „
Soit	-	621 décès en

cinq ans, c. à. d., une moyenne vraiment effrayante de 124 décès par an pour 100,000 habitants.

A partir de 1884, une mesure très importante est prise par le maire du Hâvre, M. Jules Siegfried. Dans la crainte du choléra qui avait éclaté à Ypert, il adjoint au Bureau d'Hygiène une escouade d'agents de police, chargés spécialement,—

1° de la police sanitaire.

2° de la désinfection des logements sous la direction du Dr. Launay. En agissant par persuasion sans contrainte légale, on essaie de désinfecter tous les logements atteints par la diphtérie, et, dès le début de cette salutaire institution on eu a pu suivre les rapides et heureux résultats. En effet en

1885	on constate	96	décès.
1886	„	89	„
1887	„	50	„
1888	„	57	„
1889	„	41	„
	„	331	

Soit 333 décès au lieu de 621, et depuis 1889, les chiffres ont encore diminué.

Il est donc évident que le seul moyen efficace, et facile en même temps, de combattre la diphtérie est la désinfection des logements. On peut en conclure que si l'autorité sanitaire était avertie de chaque cas de diphtérie, même en apparence bénin, il est probable, sinon certain, qu'on arriverait à réduire cette terrible maladie à un minimum relativement peu important.

La désinfection se fait : pour les vêtements, les linges, les pièces diverses de la couchure, *par l'étuve à vapeur, sans pression.* Pour les logements, elle se fait par *la combustion du soufre* avec les précautions d'usage pour que les vapeurs d'acide sulfureux ne puissent s'échapper par aucune fissure. Ce dernier mode de désinfection a été critiqué ; à tort, selon nous. Il présente le grand avantage d'être très pratique, d'être accepté par la population, et, quoiqu'on eu ait dit, il est très efficace. Les chiffres que je viens de donner en sont une preuve.

En voici une autre qui mérite de trouver sa place ici. Il y a 2 ans dans l'année de l'influenza, comme les malades affluaient à l'hôpital on dût se servir des chalets d'isolement. On prit en particulier le chalet des varioleux qui avait en des malades pendant deux ans. Eh ! bien, il suffit de désinfecter ce chalet par le soufre, pourqu'aucun des malades atteints d'influenza ne contractât la variole. Nous croyons donc à l'efficacité des vapeurs sulfureuses pour la désinfection des logements contaminés par la diphtérie.

Conclusions.

La diphthérie se propage dans une ville d'autant plus rapidement et gravement, que les rues sont plus étroites, que l'air, les courants d'air, la lumière, rencontrent plus d'obstacles à leur action bienfaisante.

La contagion s'exerce plus par les logements infectés et par les vêtements que par la transmission directe de malade à malade.

Pour l'arrêter dans sa marche envahissante, il faut une autorité sanitaire suffisamment armée, pour obtenir la désinfection de tous les logements atteints et enfin la déclaration rapide de tous les cas observés.

Resumé statisque, 10 *ans*, 1880–89.

Tandis que la mortalité diphthéritique du Hâvre est en 10 ans de 954 décès pour 112,000 celle de :

Graville est de	12·66 12·47 11·21 11·23	= 11·89
Eure de	9·70	
Vieille ville et Perrey	9·80 8·12 7·95 7·93	= 8·45
Bas de la côte	8·89	
Bande de rues entre la rue Lesueur et de Phalsbourg	7·85	
Côte et 4 chemins	6·99 6·81	= 6·90
Centre de la ville	4·75 5·15 3·24	= 4·38

The Distribution of Diphtheria* in Massachusetts.

BY

Saml. W. Abbott, M.D., Secretary to the State Board of Health of Massachusetts.

The following paper is intended to present the principal facts which relate to the prevalence of diphtheria in Massachusetts, for the period of 18 years from 1871 to 1888 inclusive, the chief point being its geographical distribution.

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* In this paper it is to be understood that the data given include *fatal croup;* since it is generally conceded by the physicians of Massachusetts that fatal croup, so far as the registration returns are concerned, cannot well be separated from diphtheria.

A brief general statement is presented as an introduction to the special topic.

The sources of information are, mainly, the annual registration reports, the voluntary returns of local health officers, and such personal inspections as have been made by the writer and others, under the direction of the State Board of Health.

1. General Description of the State.

Topographical and Climatic features.

The State of Massachusetts is one of the older and smaller States of the North American Union. In area it has a surface of about 8,000 square miles (21,000 sq. kilo.) or about two-thirds the size of Belgium.

As compared with the other States of the Union it is one of the least in area. There are but four smaller States. Texas has an area about 33 times as large. It extends over an average breadth of one degree in latitude, and three or more in longitude, the extremes of latitude being 41° 15′ and 42° 53′ N., and those of longitude being 70° and 73° 31′ W.

The land of the south-east and the island portions is low and sandy, and rises gradually toward the western border, where the northerly portion of the Appalachian range of mountains traverses the State from north-east to south-west. The average elevation of the western county is not far from 1,000 feet, with occasional elevations of 2,000 and one of 3,500 feet.

The climate presents extremes which are trying to persons of delicate constitutions. Occasional temperatures of 20° below and of 100° above zero are recorded. The mean average temperature at Boston is about 48°; and in the western counties, one or more degrees lower. Sudden changes are common, and the passage from winter to summer is often rapid. The climate of the south-eastern portion and the two islands is much more equable than that of the interior. The ground often freezes to a depth of 3 feet or more in winter, and snow covers the ground to a depth of 2 feet or more, especially in the western counties. The average rainfall is from 42 to 44 inches.

The State has an irregular sea-coast line of about 250 miles.

Population.

The State was settled in 1620 by the English, and for nearly two centuries the English constituted by far the predominant nationality represented. Since 1840 immigration from various other sources has been rapid.

Massachusetts has also contributed more than one and one-half millions of its population to the western States.

No census was taken until 1765, in which year the State had 238,195 inhabitants. The following table presents the number of inhabitants at each succeeding census :—

Population of Massachusetts.

Year.	Population.
1765	238,195
1790	378,787
1800	422,845
1810	472,040
1820	523,287
1830	610,408
1840	737,700
1850	994,514
1860	1,231,066
1870	1,457,351
1880	1,783,085
1890	2,238,943

By the State census of 1885 there was an excess of 76,373 females, so that the ratio of males to females was 100 to 109. The age periods, 20–40, contributed more than one-half of this excess, a fact which is doubtless due to the emigration of the vigorous males of these ages to the western States.

The population of the State at the census of 1880 consisted of 72·9 per cent. of persons of native birth, and 27·1 per cent. of foreign birth. Turning back to the previous generation, however, we find that of the parents 48·1 per cent. only were of native birth, and 51·9 per cent. were of foreign birth.

The accessions to the population by immigration during the past 50 years have been mainly from Ireland, the British North American Provinces, Scotland, Germany, France, Italy, and Sweden. For the past 20 years a large part of the accession from the British Provinces was of French Canadian origin.

The term *native* must be taken in a comparative sense, since the entire population is made up either of people of foreign origin, or their descendants of such class, to the number of nine or ten generations.

No allusion is here made to the aboriginal inhabitants, of whom there are less than 500 now living in the State, and of these but few are of unmixed Indian origin. They occupy two small sea-shore towns.

Density.

The State is more densely settled than any other State of the Union except Rhode Island. The average density of the population is 278·5 per square mile (by census of 1880). The population is very unevenly distributed, as is shown in Table I. (*vide postea*, page 138).

Massachusetts has followed the example of most civilised countries in the rapid increase of its urban as compared with its rural districts.

Some of the cities and towns have doubled their population within a period of 10 or 15 years. On the other hand, in very many of the small towns, which occupy districts remote from railway travel, the population has for many years been stationary, and, in not a few, diminishing. Some towns have a smaller population than they had in 1790.

About 38 per cent. of the population live within a radius of 10 miles of Boston.

Vital Statistics.

The marriage, birth, and death-rates of the State for the past 40 years have been as follows :—

Periods.	Marriage-rates (Persons Married).	Birth-rates.	Death-rates.	Excess of Births over Deaths.
1851–55 - -	23·4	28·9	18·7	10·2
1856–60 - -	19·6	29·5	17·9	11·6
1861–65* - -	18·7	25·3	20·7	4·6
1866–70 - -	21·0	26·1	18·2	7·9
1871–75 - -	19·8	27·6	20·8	6·8
1876–80† - -	16·0	24·7	19·2	5·5
1881–85 - -	18·5	25·1	19·8	5·3
1886–90 - -	18·6	25·9	19·4	6·5

* Civil war. † Financial depression.

The birth-rates and death-rates of the urban and the rural population for the census years were as follows :—

Birth-rates per 1,000.

——	1865.	1870.	1875.	1880.	1885.
The cities - - -	25·7	27·2	29·7	28·2	27·7
The remainder of the State - -	22·6	25·6	23·8	27·5	21·7

Death-rates.

——	1865.	1870.	1875.	1880.	1885.
The cities	22·1	21·6	23·9	22·1	21·2
The remainder of the State - -	19·8	16·6	18·7	18·6	17·6

The following are the mortality rates from the principal infectious diseases for the 20 years ending with 1888 :—

MORTALITY from certain INFECTIOUS DISEASES, 1869–1888, expressed as an annual ratio per 10,000 of the living population.

Year.	Small-pox.	Measles.	Scarlet Fever.	Typhoid Fever.	Diphtheria and Croup.	Phthisis.	Cholera Morbus.
1869	0·4	1·6	9·9	8·5	5·4	32·8	13·1
1870	0·9	1·8	4·7	9·1	4·6	34·3	13·1
1871	1·9	·9	5·8	7·5	5·0	33·9	11·5
1872	6·7	2·8	8·9	11·1	4·9	36·2	21·2
1873	4·3	1·1	9·4	8·9	4·7	35·3	16·2
1874	·2	1·0	8·6	7·1	5·6	32·8	14·4
1875	·2	1·4	10·2	6·4	11·4	34·7	15·8
1876	·2	·3	7·4	5·3	19·9	32·2	12·6
1877	·15	·8	2·8	4·9	19·1	32·9	11·6
1878	·01	1·8	2·4	4·1	15·0	32·0	9·4
1879	·04	·1	4·9	3·7	13·4	30·4	7·9
1880	·2	1·3	3·2	4·9	13·5	30·8	11·3
1881	·2	1·3	2·2	5·9	12·6	32·4	10·2
1882	·2	·4	1·7	5·6	9·5	31·7	11·7
1883	·03	1·7	3·5	4·5	8·6	31·5	10·3
1884	·01	·4	3·3	4·5	8·5	30·3	10·9
1885	·1	1·6	3·0	3·9	7·8	30·7	9·5
1886	—	·6	1·7	4·1	7·9	29·5	9·8
1887	·01	2·3	2·9	4·5	8·1	28·5	10·6
1888	·04	1·1	2·5	4·6	9·0	27·1	10·7

We come now to the special topic which forms the title of this paper, the geographical distribution of diphtheria and croup in Massachusetts.

The term diphtheria does not appear in the registration reports of the State until 1858, a fact which has but little bearing upon the question of its prevalence at an earlier period.

From 1858 the annual number of deaths assigned to this cause rapidly increased until 1863, when 1,420 deaths were reported from this cause, and 1,231 in 1864. There was then a rapid decline till 1867, when there were but 251 deaths registered from this cause, and the annual number continued at quite a uniform rate of about 275 deaths for the next seven years, when it rose again to 2,610 in 1876 and to 2,734 in 1877.

It appears that the diphtheria death-rate bears no relation to the general death-rate, except in the period 1862 to 1867, when the two curves appear to run nearly parallel. But in 1872, when the general mortality rate was at its highest point and infectious diseases were generally very prevalent, the diphtheria death-rate was far below the mean, and in 1876 and 1877, when the general death-rate was quite near the mean, the diphtheria death-rate was at its highest point.

For the purposes of this paper the city and township will be considered chiefly as the unit of population for comparison ; but, in the first place, the counties should be considered in a general way, although the county lines have but little sanitary significance.

The areas, the population, the density, and the diphtheria death-rates of the counties are presented in Table I. (*see* page 138). The following general features of the counties may be outlined, beginning with the western border of the State.

Berkshire county consists mainly of high land, its average level being nearly 1,000 feet above the sea. There are many mountains and hills of 1,500 to 3,500 feet, with deep valleys and swift watercourses. There is an abundance of forest land. There are a few thriving manufacturing towns. The manufacture of paper is largely carried on upon the pure clear watercourses of this county. The population of the county slowly increases, but in many of the small towns remote from railway travel it has retrograded. The average density of the population is 85 per square mile.

The winters are long and severe, the snow often lying upon the ground in the forests, especially in the northern portion, until late in April.

The next three counties may be considered together. Franklin, Hampshire, and Hampden counties lie upon the east and west sides of the Connecticut river, in the order named, from north to south. The land in the two first named is generally higher than that in Hampden, the southern county of the group. The Connecticut river divides them all nearly in twain, while four tributaries drain the areas upon each side, entering the Connecticut at nearly opposite points upon each side of the river.

The population of Franklin and Hampshire counties is chiefly agricultural, while that of Hampden has a much greater manufacturing population, distributed in several rapidly increasing cities and towns.

The density of population in these counties is as follows :—

Franklin	- -	56·5 per square mile.
Hampshire	- - -	90·6 ,, ,,
Hampden	- -	214· ,, ,,

Worcester is the central county of the State, and the largest in area. It is mainly occupied by an agricultural population. It has one large and one small city, and several enterprising manufacturing towns. The land is generally high in the northern portions and lower in the southern.

Suffolk is the metropolitan county, and includes the seaport and city of Boston. The county contains about half a million of inhabitants, which gives, in its limited area, a density of about 10,000 per square mile.

Middlesex and Norfolk join Suffolk upon the north and south, and are quite densely settled in the suburban portions. The former has a large manufacturing population in some of its towns, and has many towns of extremely rapid growth. Some of them have doubled within the past decade.

Essex, the north-eastern county, has a bold, rugged sea-coast, several manufacturing cities of moderate size and healthy growth, one or two large fishing ports. The land, especially near the coast, presents

but few elevations. The Merrimack river passes through its northern portion to the sea.

Bristol and Plymouth occupy the south-eastern part of the State (exclusive of Cape Cod). They include four thriving manufacturing cities. The growth of Bristol is more rapid than that of Plymouth. The climate is generally milder than that of the counties already named.

Barnstaple county is Cape Cod, a long, flat, sandy peninsula, stretching east and northward seventy miles or more. It has no cities or larger towns, and its population is diminishing by emigration. The principal occupations are fishing and the culture of cranberries. The climate is insular. Many of the towns are becoming places of summer resort, on account of the equable temperature and facilities for sea-bathing.

The two island counties have similar characteristics to Barnstaple. They are sandy islands.

The average density of population of these three counties is about 70 per square mile.

Classification by Cities and Towns.

The mortality rates in the list of cities and towns (*see* Table IV., pp. 140 *et seq.*), have been compiled from the annual registration reports of the State for the period 1871–1888.

The number of municipalities having a city government at the beginning of this period was 14, and the number having such form of government at the close of the period was 28. Those having town governments at the beginning of the period were 322, and at the close 318.

A few changes have been made in the dividing lines of towns, for which due allowance has been made where the changes included territory containing a considerable number of inhabitants, and a few new towns have been incorporated.

A table of mortality-rates from diphtheria is also presented for the counties, but for the purposes of the present paper the town is taken as the unit of comparison.

Arbitrary methods must necessarily be taken for expressing the ratios of mortality, and in many instances towns occupying an area of 50 or even 100 square miles of surface may have a rural population of one, two, or three thousand inhabitants, occupying but a small portion of this area. The population of each municipality, by the census of 1880, as well as the mortality-rate from diphtheria, are therefore presented together. The population of 1880 is given for the basis for the ratio, since it is assumed as an average or mean for the period of 18 years. The writer recognises the fact that conclusions made from the statistics of small populations cannot be regarded as trustworthy, even for considerable periods of time. Hence the principal conclusions in this paper

will be taken from large groupings, and not from the extremely small populations of the towns in rural districts.

In examining the conditions which prevail in these towns as presented in this table, there are some points which are worthy of notice in connexion with the extremes at the top and bottom of the list.

Of the 15 towns which stand at the end of the list as having excessive mortality rates from diphtheria and croup in the period under consideration, five are small, or comparatively small, and contiguous towns in the north-west corner of the State.

These towns are mainly inhabited by a sparsely settled farming population, and their average level above the sea is much higher than that of the State in general. The lowest land in this district is at least 500 feet above the sea, and the average level of the district is not far from 1,200 feet above the sea-level. The district is very thickly wooded with forests of oak, pine, maple, and other woods, except in the valleys, which have a comparatively small area of cultivated meadows and low land. One small river flows through the district in a general north-westerly direction, receiving many rapid mountain brooks as tributaries. There is one manufacturing town, a railroad centre of 15,000 inhabitants.

Florida, which had the highest death-rate from these causes for the period, is a hilly town of small population (459 in 1880). The Fitchburg Railroad passes under the town, from its eastern to its western border, a distance of five miles, by means of the Hoosac Tunnel. The second town upon the list in point of prevalenee is Spencer, an interior town of Worcester county, situated mainly upon a high hill, and having a comparatively dense population (7,466 in 1880), engaged mostly in shoe manufacture.

The third town, Freetown, is a town of comparatively small population (1,329 in 1880), in Bristol county, adjoining the manufacturing city Fall River. The land is level and sandy.

Adams, Williamstown, and Hancock are all in north-western Berkshire, upon high land. Adams has a considerable manufacturing population upon the bank of the Hoosac River.

Webster is a manufacturing town in Worcester county, on comparatively low land. Ayer is a railroad centre in northern Middlesex. The land is quite level in the settled portion of the town.

Nantucket is both town and county; the population is a peculiar one, being the remnant of a once populous whaling and fishing port of nearly 10,000 inhabitants, now reduced to about 3,000 by emigration. Its birth-rate is very low, and its death-rate high, these exceptional conditions being produced by the emigration of the young and vigorous portion of the population, leaving the older portion, amongst whom the mortality-rate is high. The crowding together of the population into a densely compacted town upon a land-locked harbour undoubtedly has contributed to the same result.

Turning now to the other extreme, four towns had no deaths from diphtheria during the period under consideration. All of these are small towns. Their chief characteristic is *inaccessibility.* Neither of them is upon or near a railway line, and public travel through them is very limited. Mt. Washington is cut off from the rest of the State and from the Housatonic Railway by a range of high hills. Chilmark is a remote town upon the island of Martha's Vineyard, at a distance from the points of summer resort.

Dividing the State by a more general classification into rural and manufacturing towns, there are 254 of the former class, and 92 of the latter. The general characteristics of these two classes are as follows:—

Rural towns.—These are mainly towns of small population, distributed over an average area of nearly 30 square miles for each township. The principal occupation of the population of these towns consists of dairy farming, market gardening, and other branches of agriculture.

The entire population of this class of towns in 1880 was 440,664, giving an average for each of the 254 towns of 1,735 inhabitants. Five only, out of this number, had more than 5,000 inhabitants in each by the census of 1880. A few of these towns are summer resorts, either upon the sea-coast or in the inland region. Some of the towns of this general class have increased slightly in population in the past 25 years, many have remained stationary, and a considerable number have slowly decreased. The younger and more vigorous producing part of the population has emigrated either to the cities or to the western States.

The other class, embracing the cities and manufacturing towns, 92 in number, had a population of 1,342,421 in 1880, an average of 14,591 to each city or town. These towns are much more densely populated than the former class. Most of them have a steadily increasing population, a large portion of which consists of immigrants, either of European nativity or from the British North American provinces. Five only of the towns of this class had less than 3,000 inhabitants. In many of the towns of this class there is a rural population of considerable size living in those portions outside the more densely settled villages. The actual increase in population in the rural towns for the period of 20 years, between the census of 1870 and that of 1890, a period nearly coincident with that under consideration, was $11\frac{1}{4}$ per cent., while that of the larger or manufacturing and urban districts was 70 per cent. Certain exceptional cities and towns in this group are worthy of notice. Newton is neither a manufacturing nor a densely settled municipality, but a suburban residential city, with a population consisting mainly of wealthy or comparatively well-to-do inhabitants. Its general death-rate, as well as that from croup and diphtheria, has usually been low. I have placed Provincetown and Nantucket in the same group, each of which has a considerable area of nearly unoccupied sandy territory lying outside the densely settled seaport. The former had an average general death-rate, and a low diphtheria death-rate, while the latter had a very high death-rate from all causes as well as from

diphtheria. Both towns are exposed to sea breezes throughout the year.

The average annual death-rate from diphtheria and croup in the 92 densely settled towns and cities for the 18 years (1871 to 1888), was 11·39 per 10,000 of the population, while that of the 254 rural or sparsely settled towns was 6·53 per 10,000 for the same period.

The relation of certain railway lines to the diphtheria death-rate is worthy of note. There were, during the period in question, about 2,000 miles of railway in operation in the State. Many of the towns of small size are at a considerable distance from these railways, or are of so little importance that very few stations are located in such towns.

The Boston and Albany Railroad, the principal line from the seaport of Boston through the State to the west (a distance of 150 miles), carries a very large number of passengers each year,* and has one or more stations in nearly every town through which it passes. The greater number of cities and towns through which this railway passes had comparatively high diphtheria death-rates. Those upon the line of the Fitchburg Railroad another line of similar length, but having much less traffic, had lower diphtheria death-rates, while those upon the Massachusetts Central, a line of about 100 miles in length, also running east and west, but of comparatively recent construction, had, in general, still lower death-rates from the same disease.

It is also worthy of note that, out of the 28 cities, 20, including all of the most populous, except Fall River, had a death-rate from diphtheria and croup higher than the average of the State; and of these, 20 were in the second group (these having from 0 to 50 per cent. higher rates than the average of the State). The remaining city, Holyoke, which had a diphtheria death-rate of 15·38 per 10,000 per year for the period, is a thriving city of rapid growth (pop. in 1850, 3,245; in 1890, 35,528), the principal industry of which is the manufacture of paper. It has a population in which the Canadian French form a considerable fraction.

The metropolitan district, comprised in the city of Boston and the contiguous cities and towns of Cambridge, Somerville, Malden, Chelsea, Everett, Quincy, Lynn, and Brookline, constituting a comparatively densely populated and rapidly increasing district, had a mortality-rate from diphtheria and croup which was quite uniform, and considerably above the average of the State, being very nearly 12·5 per 10,000 annually, the exception being Brookline, with a mortality rate from these causes of 8·9 per 10,000. That of Newton, a little further out, was 7·2; and that of Woburn, 10 miles out, was 6·1. Brookline and Newton are not densely populated, and the social character of their population is much better than the average of the metropolitan district.

In this connexion, the effect of age-distribution in the different districts of the State should be considered, since the greatest mortality from diphtheria and croup is at the younger ages up to 5 and from 5 to 10 years.

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* About 11,000,000 in 1890.

The following tables show the average annual mortality at each age-period expressed as a ratio per 10,000 of the population living at those ages, for the period of 27 years, ending with 1889 :—

Ages.	Diphtheria.	Croup.
Under 5 - - -	36·87	27·86
5 to 10 - -	19·80	4·63
10 to 15 - - -	5·38	·29
15 to 20 - -	1·66	·05
20 to 30 - - -	·80	·02
30 to 40 - -	·58	·03
40 to 50 - - -	·36	·02
50 to 60 - -	·34	·02
60 to 70 - - -	·54	·01
70 to 80 - -	·53	·02
Over 80 - - -	·41	·06

The numbers of deaths from which the foregoing table is computed are 29,422 of diphtheria and 14,590 of croup.

The range of age-distribution in the different districts is very considerable, the ratio of children under 5 in the smallest district under consideration, which also has the lowest ratio, being 6·1 per cent. of the total population in Nantucket, and the highest ratio being 10·2 per cent. in Suffolk county.

The relation of the mortality from diphtheria and croup, to the population living under 5 years of age, may be seen in the third column of figures in Table II. (*vide postea*, page 139), by which it appears that the rank of some of the districts is slightly changed, as compared with their position in the preceding column, in those counties which have a nearly identical rank in the second column.

For the sake of comparison with the excellent tables of Dr. Longstaff, presented in the Report of the Local Government Board of 1887, I have introduced another table intended to conform to Dr. Longstaff's classification (*vide* Table III., page 139, *post.*). I have, in this table, divided the 14 counties into three groups, to which the terms dense, medium, and sparse districts are applied, the first applying to those in which there is less than one acre to each person living. This includes only the metropolitan district of Suffolk county. The second (medium) applies to those in which there is one acre, but less than two acres to each person. This comprises the counties of Essex, Middlesex, and Bristol. The sparse districts, those in which there are more than two acres to each person, comprise the remaining counties. In this grouping, the small island counties of Dukes and Nantucket are reckoned with Barnstaple county, their general characteristics, both of population and of climate being quite similar. In the densely settled district, having but $\frac{6}{100}$ of an acre to each person, the average annual mortality-rate from diphtheria and croup was 12·7 per 10,000 of the population. In the medium districts, in which the average density was 1·4 acres to each person, the mortality-rate was 10·2 per 10,000.

In the sparsely settled districts, in which the average density was 4·8 acres to each person, the mortality-rate was 8·8 per 10,000 annually.

Assuming the mortality of the dense districts as 1,000, we have the following results :—

Mortality from diphtheria in			*dense*	districts,	1,000.
"	"	"	*medium*	"	803.
"	"	"	*sparse*	"	609.

While these figures present a result which differs from the statistics of England and Wales, it should be remembered that they are compiled from a population less than one-tenth as large, and are, therefore, less trustworthy as sources from which conclusions are to be drawn.

In another point, however, the conclusions agree with those of Dr. Longstaff, and that is, that in the second half of the period the towns suffered, relatively, more than in the first half.

In 18 out of the 28 cities, their relative position or rank in the list of cities or towns with reference to mortality from diphtheria and croup had materially increased from the first to the second half of the period of 18 years under consideration, and these 18 included the six largest cities in the State.

The districts which suffered most severely, taking the whole period of 18 years, were the northern half of Berkshire county, that portion of the valley of the Connecticut River within the State, which lies in Hampshire and Hampden counties, and the valleys of the Westfield and Chicopee Rivers, with the tributary valleys of the latter, the southern half of Worcester county, the metropolitan district about Boston, the Merrimack River valley, the southern sea-coast region of Essex county, the eastern part of Norfolk county, the eastern border of Bristol county, the north-west corner of Plymouth county, and the town of Nantucket.

Those regions which had the greatest immunity were the southern half of Berkshire county, the whole of Franklin county, the east and west parts of Hampshire county, the west part of Hampden county, the northern half of Worcester county, the north and west part of Middlesex, the north-east sea-coast district of Essex, the west half of Norfolk, the western border of Bristol, nearly all of Plymouth, and the whole of Barnstaple and Dukes counties.

If we now examine the data presented in Table IV., with reference to the characteristics of the extremes, so far as the frequency of appearance of diphtheria in cities and towns is concerned, we find the following facts, beginning with those localities which have the lowest ratios of mortality from this cause.

In the town of Barnstaple, the county-seat of the county of the same name, having a mortality of 22 only as compared with 100 for the whole State, deaths from diphtheria occurred in 11 years out of 18. This town has a large land area sparsely settled, is washed by the sea upon its entire northern and southern boundaries, is swept by sea

breezes throughout the year, and has no other special features worthy of note.

In Provincetown, where deaths occurred in 11 years, the population is crowded into a narrow strip of territory, mostly occupying one or two long streets, lying parallel with its harbour.

Amherst, with deaths in 10 years, has one village, not very densely settled, with a farming population of considerable size, occupying the outlying parts of the town. It is also the seat of two educational institutions.

Leominster, with deaths in 13 years, is a thriving manufacturing town, with a comparatively dense population.

Three towns, Clinton, Woburn, and Attleboro', had quite low ratios of mortality from diphtheria, although it occurred in them in each of the 18 years. They were also, with one exception, the three largest towns among those having low ratios of mortality from this cause. Each is a manufacturing town, with rapid increase of population, quite densely settled, and having a large ratio of persons of foreign birth.

Of the first 100 towns upon the list, nearly all, with these exceptions already noted, are small towns having small populations, mostly less than 2,000 in each. There are no cities in this group, and the only cities in the second group of 100 places having ratios of mortality lower than that of the State are Woburn, Marlborough, Newburyport, and Newton, all of them being cities of comparatively small size.

The characteristics of the first 10 towns at the other end of the list, having unusually high ratios of mortality, have been briefly stated in an earlier part of this paper.

The first 25 towns (reckoning from this end of the list) having high rates of diphtheria-mortality, in which, also, deaths occurred in every one of the 18 years, were, almost without exception, thriving manufacturing places, and nearly all were cities with a comparatively dense population.

The 20 towns which had high ratios of mortality from diphtheria, but in which it occurred in less than 10 years out of the 18, were all small, unimportant, and sparsely settled towns.

In comparing the distribution of fatal diphtheria and croup in the State with that of other diseases, certain other similar inquiries relating to the other principal infections diseases tend to show that diphtheria is " not regulated by the same causes as influence the general mortality," except that, so far as the density of population is concerned, the results of observations in Massachusetts lead us to an opposite conclusion from that which is derived from the statistics of England and Wales.

In the course of personal inspections made in many parts of the State, in city, town, and country districts, my observations tend to support the following statement found in the report already quoted, with reference to the increasing severity of prevalence in towns as compared with country districts.

" If we grant for a moment the exciting cause of the disease to have its origin in the country, it is just possible that the constantly increasing communication between town and country, by affording

additional opportunities of importing the disease, might account for its increased prevalence in towns.

"Although the greater proximity of people in towns would, at first sight, seem to increase greatly the chances of infection, it is by on means certain that the individuals of a town community come so much into personal contact as the dwellers in a lonely hamlet. There may be but few opportunities for the introduction of the poison into an isolated village, but once introduced there are great facilities for its spread. In a village, everyone knows his neighbours, whereas in a large town, dwellers in the same street are often complete strangers to each other."

In the same line of investigation, and in harmony with the foregoing quotation, the following extract from a paper presented at the eighteenth annual meeting of the American Public Health Association, held at Charleston, S.C., is herewith quoted :—

"The following inquiry was directed to be made by the State Board of Health of Massachusetts, in 1889. In a city in which diphtheria was epidemic, 100 houses were selected for examination and inspection. A recent, and quite severe, epidemic had prevailed, in which there had been 174 deaths from diphtheria in the course of the year (1889). Fifty houses were selected in which cases of diphtheria were known to have occurred within 12 months prior to the time of inspection; 50 other houses were selected in which it was known that no cases of diphtheria had occurred during the previous five years. In general terms the houses of the latter class were as nearly identical with the former in their location, construction, and the social condition of their inmates as possible. On inspection, the actual sanitary condition of these houses was found to differ but little in the two classes. Defects of plumbing, want of proper traps, leaks in drain pipes, and other similar defects were found about equally in the two. Not one of the 100 houses had special provision for ventilation. In one point only did there appear to be a marked difference in the two classes, and that was in the ratio of damp cellars. In the houses in which diphtheria had existed, the ratio of damp cellars was as eight to five when compared to the houses of the other class. I believe this is in accord with the observations of others to the effect that where diphtheria has once been introduced from without, it finds in dampness a congenial soil for its propagation.

"If it is desired to trace the course of an epidemic of diphtheria amid the mazes of a densely crowded city, there can be no more difficult task imagined. The daily influx and efflux of population to and from the suburbs, the thronging of people in shops, markets, factories, steam-cars, horse-cars, and electric-cars, the crowding together at lectures, church services, entertainments, theatres, and, finally, in the public and private schools, give the best facilities for the spread of epidemic disease. On the other hand, isolated communities occasionally present excellent opportunities for the careful study of the methods of spread of such an epidemic disease as diphtheria. Such a case presented itself to my notice during the past year. A quiet old town

in Berkshire county, near the source of the Farmington River, has comparatively little connexion with the outside world. It is 18 miles from the nearest railroad, has no hotel, and has but little regular traffic with neighbouring towns. In the spring of 1888, a school-teacher, a native of this town, was employed as teacher of a school 25 miles distant. At the close of her term of teaching, in June 1888, she went home ill, her illness proving, on her arrival home, to be diphtheria. Within the next six months, cases occurred in the immediate family of this young woman and those of her relatives, no quarantine having been enforced. It spread across the street to the house of the family physician. Several deaths occurred in these two families. The family of the physician was shattered, and he left the town, his house being abandoned and vacant for several months. The postmaster of the village was also the village grocer. People went to and from the post-office from the first infected house, and the grocer also made frequent visits to the house with his groceries. His family was next attacked, and so severely, as to be broken up and scattered. After the house of the village physician had remained vacant several months, and some inefficient attempts at disinfection had been practised, a new physician moved into and occupied the vacant house. Soon after moving in, his children were attacked. A lying-in woman whom he attended, together with her seven-year-old boy, were both attacked. A neighbour who called upon this woman was next attacked; and so the history of this epidemic could be traced from house to house, and from one individual to another, for a period of 18 months or more. The houses of these people, which were visited, did not appear to be especially filthy, but in two or three instances, excessive dampness of the neighbouring soil was noticed. In the case of the physician, whose family was attacked after moving into the house which was formerly infected, the permanence of the diphtheritic germ appears to be illustrated. This history of successive outbreaks occurring in one house after the lapse of a long interval is not uncommon.

"The history of the disease in the small town to which I have referred was that of introduction from without, and then of continuous infection from one person to another through the public schools, the unwise visits of inquiring friends, the usual household visits of the grocer, the want of care on the part of the attending physician, and many other similar avenues of communicability."*

The foregoing observations are submitted merely as a small contribution to the history of diphtheria. The writer's general observations lend weight to the following conclusions :—

1. That diphtheria is an eminently contagious disease.

2. That it is infectious, not only by direct exposure of the sick to the well, but also through indirect media, such as clothing and other articles that have come in contact with the sick.

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* "What constitutes a Filth-Disease," a paper read by S. W. Abbott, M.D., at the meeting of the American Public Health Association, at Charleston, S.C., December 18, 1890.

3. That the certainty of infection is not so great as in the case of some of the other infectious diseases, notably small-pox and scarlet fever.

4. That overcrowding, faulty ventilation, and filthy condition of tenements favour its spread.

5. That the influence of defective plumbing is not proven.

6. That its transmission through public and private water-supplies is not proven.

7. That its propagation is favoured by soil-moisture, damp cellars, and general dampness of houses.

8. That the poison may remain ineffective in houses for a long period.

9. The statistics of Massachusetts for the period in question apparently support the conclusion that its prevalence is favoured by density of population.

10. That the aggregation of people and especially of children, as in public and private schools, in workshops, in factories, and in public assemblies, facilitates its spread.

11. That public funerals promote its spread, and although the body of a person, dead from diphtheria, is to be regarded as dangerously infective, the house, and especially the room, in which such person lived during his illness, are also to be regarded as infective. The living, moving, and breathing human being suffering from diphtheria is more dangerous than the body of one who has died of the same disease.

Table I.

By the census of 1890, the population and density of the 14 counties were as follows:—

Death-rates from Diphtheria and Croup per 10,000 of the Population.

Counties.	Area in Square Miles.	Population.	Persons to Square Mile.	Deaths from Diphtheria and Croup.	Total Population.	Children under 5 Years.
Barnstaple -	373	29,172	78·2	332	5·8	69·0
Berkshire -	959	81,108	84·6	1,450	11·7	108·7
Bristol -	557	186,465	334·8	2,356	9·4	90·0
Dukes -	124	4,369	35·2	10	1·3	20·0
Essex -	503	299,985	596·0	4,627	10·5	110·0
Franklin -	665	38,610	56·5	405	6·2	65·0
Hampden -	634	135,713	214·0	2,120	11·3	108·8
Hampshire -	572	51,859	90·6	617	7·3	79·0
Middlesex -	827	431,167	521·0	5,801	10·1	98·7
Nantucket -	65	3,268	50·3	110	16·4	253·6
Norfolk -	494	118,950	240·8	1,485	8·5	86·0
Plymouth -	671	92,700	138·1	1,008	7·6	86·3
Suffolk -	45	484,780	10,772·9	8,897	12·7	124·6
Worcester -	1,551	280,787	181·1	3,453	8·4	79·6
The State -	8,040	2,238,943	278·5	32,715	10·2	101·3

TABLE II.

Counties of Massachusetts arranged according to their death-rates from diphtheria and croup (1871–1888). The State being taken as 100, with the density of the population expressed in acres to each person.

Counties.	Density of Population. Acres to One Person.	Death-rates from Diphtheria and Croup. The State = 100.	
		Total Population.	To Children under Five.
Dukes - - -	18·2	13	20
Barnstaple - - -	8·2	57	68
Franklin - - -	11·3	61	64
Hampshire - - -	7·1	72	78
Plymouth - - -	4·6	75	85
Worcester - - -	3·5	82	78
Norfolk - - -	2·6	83	85
Bristol - - -	1·8	92	90
Middlesex - - -	1·2	99	97
The State - - -	2·3	100	100
Essex - - -	1·1	103	109
Hampden - - -	3·0	111	107
Berkshire - - -	7·6	115	107
Suffolk - -	0·06	124	123
Nantucket - - -	12·7	161	251

TABLE III.

DENSITY OF POPULATION in relation to DIPHTHERIA-MORTALITY.

Counties arranged according to Density.	Counties.	Density Acres to One Person.		Death-rate from Diphtheria and Croup.	
Districts in which there is less than one acre to each person living - - -	Suffolk - -	0·6		124	
Districts in which there is more than one acre to each person but less than two acres - - -	Essex - -	1·1	Average 1·4	103	Average 100
	Middlesex -	1·2		99	
	Bristol - -	1·8		92	
Districts in which there are more than two acres to each person - - -	Norfolk -	2·6	Average 4·8	83	Average 87
	Hampden -	3·0		111	
	Worcester -	3·5		82	
	Plymouth -	4·6		75	
	Hampshire -	7·1		72	
	Berkshire -	7·6		115	
	Barnstaple, Dukes, and Nantucket -	10·1		62	
	Franklin -	11·3		61	

Table IV.

Cities and Towns of Massachusetts arranged in the order of their Death-rates from Diphtheria and Croup, the rate for the State being taken as 100.

No.	—	Rank.	Population (1880).	Number of Years in which Deaths from Diphtheria and Croup occurred.
1	Mount Washington	0	205	0
2	Cummington	0	881	0
3	Chilmark	0	494	0
4	Tolland	0	452	0
5	Lincoln	6	907	1
6	Gill	7	733	1
7	Phillipston	8	621	1
8	Hampden	10	958	1
9	Tisbury	10	1,518	2
10	Littleton	11	994	1
11	Berlin	11	977	2
12	Charlton	11	1,900	3
13	Plainfield	12	457	1
14	Bolton	12	903	2
15	Wenham	12	889	2
16	New Salem	12	869	2
17	Harvard	13	1,253	3
18	Worthington	14	758	2
19	Dana	15	736	2
20	Ashfield	15	1,066	2
21	Norton	16	1,732	3
22	Goshen	16	327	1
23	Tyngsborough	17	631	2
24	New Braintree	18	610	2
25	Marshfield	18	1,781	4
26	Boylston	19	854	3
27	Edgartown	20	1,303	4
28	Southwick	20	1,104	3
29	Wrentham	20	2,481	6
30	Halifax	20	542	2
31	Rutland	21	1,059	3
32	Sunderland	22	755	3
33	Barnstable	22	4,242	11
34	Sheffield	22	2,204	2
35	Warwick	23	713	3
36	Topsfield	23	1,165	3
37	Ashby	24	914	4
38	Dunstable	24	453	2
39	Provincetown	25	4,346	11
40	Middlefield	25	648	2
41	New Ashford	27	203	1
42	Sherborn	27	1,401	5
43	Acton	27	1,797	7
44	Dighton	27	1,791	7
45	Otis	28	785	4
46	Chesterfield	28	769	4
47	Amherst	29	4,298	10
48	Bernardston	29	934	4
49	Barre	29	2,419	8
50	Westminster	30	1,652	5
51	Lunenburg	30	1,101	5
52	Burlington	31	711	3

TABLE IV.—*continued.*

No.	—	Rank.	Population (1880).	Number of Years in which Deaths from Diphtheria and Croup occurred.
53	Cottage City	31	672	2
54	Shutesbury	31	529	3
55	Newbury	31	1,566	5
56	Hubbardston	31	1,386	3
57	Eastham	31	692	2
58	Rehoboth	32	1,891	8
59	Rowley	32	1,201	5
60	Leominster	32	5,772	13
61	Kingston	32	1,524	6
62	Leyden	32	507	3
63	Lakeville	32	1,008	4
64	Billerica	32	2,000	6
65	Monroe	33	166	3
66	Dover	33	653	3
67	Blandford	33	979	4
68	Nahant	33	808	5
69	Gay Head	33	161	1
70	Boxborough	34	319	2
71	Chelmsford	34	2,553	8
72	Petersham	34	1,109	7
73	Holden	35	2,499	7
74	Lancaster	35	2,008	9
75	Pelham	35	614	3
76	Prescott	35	460	2
77	Mattapoisett	35	1,365	6
78	Medfield	35	1,371	5
79	Gosnold	35	152	1
80	West Bridgewater	36	1,665	6
81	Holland	36	302	2
82	Hawley	36	592	9
83	Sandwich	36	3,543	11
84	Great Barrington	37	4,653	10
85	Upton	37	2,023	6
86	Richmond	39	1,124	4
87	Duxbury	40	2,196	10
88	Whately	40	1,074	6
89	Westford	40	2,147	9
90	Foxborough	40	2,950	12
91	Hudson	40	3,739	8
92	Auburn	41	1,317	9
93	Weston	41	1,448	6
94	Mansfield	41	2,765	8
95	Concord	41	3,922	12
96	Franklin	41	4,051	12
97	Stow	41	1,045	5
98	Northborough	42	1,676	10
99	Sterling	42	1,414	11
100	Winchendon	42	3,722	12
101	Pembroke	42	1,405	7
102	Truro	42	1,017	6
103	Brewster	42	1,144	5
104	Orange	42	3,169	8
105	Middleborough	43	5,237	15
106	Stockbridge	44	2,357	9
107	Leverett	44	742	4
108	Easthampton	44	4,206	13
109	Blackstone	44	4,907	13
110	Granville	45	1,205	7
111	Raynham	45	1,680	9
112	Marion	45	958	4

TABLE IV.—*continued.*

No.	——	Rank.	Population (1880).	Number of Years in which Deaths from Diphtheria and Croup occurred.
113	Essex - - -	45	1,670	8
114	Paxton - - -	45	592	4
115	Scituate - - -	46	2,466	10
116	New Marlboro - -	46	1,876	8
117	Wendell - - -	46	465	4
118	Alford - - -	46	348	2
119	Rochester - - -	46	1,043	6
120	Shelburne - -	47	1,621	9
121	Townsend - - -	47	1,967	8
122	Westport - -	47	2,894	13
123	Mashpee - - -	47	346	4
124	Sturbridge - -	47	2,062	9
125	Lynnfield - - -	47	686	3
126	Swanzey - - -	48	1,355	7
127	Ipswich - - -	48	3,699	10
128	Wellesley - -	49	395	5
129	Medway - - -	49	3,956	12
130	Clinton - - -	49	8,029	18
131	Southborough - -	50	2,142	8
132	Norwell - - -	50	1,820	8
133	Hinsdale - - -	51	1,595	7
134	Chester - - -	51	1,473	6
135	Shirley - - -	51	1,365	5
136	Colrain - - -	52	1,777	6
137	Wellfleet - - -	52	1,875	10
138	Deerfield - -	52	3,543	12
139	Tewksbury - - -	52	2,179	9
140	Melrose - - -	52	4,560	16
141	Sutton - - -	52	3,105	12
142	Norfolk - - -	52	930	6
143	Lexington - - -	53	2,460	11
144	Becket - - -	53	1,123	5
145	Ludlow - - -	53	1,526	10
146	Hanover - - -	54	1,897	7
147	Medford - - -	55	7,573	17
148	Sudbury - - -	55	1,178	6
149	Hardwick - - -	56	2,233	8
150	Walpole - - -	56	2,494	11
151	Athol - - -	57	4,307	11
152	Rockland - -	57	4,553	11
153	Chatham - - -	58	2,250	8
154	Hamilton - -	58	935	4
155	Wareham - - -	58	2,896	15
156	Bedford - - -	58	931	7
157	Bridgewater - -	59	3,620	15
158	Dartmouth - -	59	3,430	7
159	Sandisfield - - -	59	1,107	5
160	Ashburnham - -	59	1,666	9
161	Woburn - - -	60	10,931	18
162	Royalston - -	60	1,192	3
163	Brookfield - - -	60	2,820	11
164	Marlborough - -	60	10,127	16
165	Greenwich - - -	60	633	4
166	Williamsburg - -	61	2,234	12
167	Shrewsbury - -	62	1,500	4
168	Sharon - - -	62	1,492	10
169	Erving - - -	62	872	7
170	Belchertown - - -	62	2,346	9
171	Uxbridge - - -	63	3,111	9

TABLE IV.—*continued.*

No.	——	Rank.	Population (1880).	Number of Years in which Deaths from Diphtheria and Croup occurred.
172	Manchester - -	63	1,640	7
173	Attleborough - -	63	11,111	18
174	Berkley - - -	64	927	7
175	Templeton - - -	64	2,789	14
176	Bradford - -	65	2,643	12
177	Boxford - - -	66	824	5
178	Washington - -	66	493	2
179	Abington - - -	66	3,697	13
180	Andover - -	66	5,169	16
181	Reading - - -	67	3,181	12
182	Winchester - -	67	3,802	14
183	Swampscott - -	67	2,500	11
184	Newburyport - -	67	13,538	17
185	Enfield - - -	68	1,043	9
186	Salisbury - -	68	4,079	17
187	Egremont - - -	69	875	5
188	Buckland - -	69	1,739	7
189	Longmeadow - -	70	1,401	8
190	Newton - - -	70	16,995	17
191	Leicester - - -	70	2,779	13
192	Hull - - -	71	383	2
193	Grafton - - -	71	4,030	13
194	Montgomery - -	71	303	3
195	Falmouth - - -	72	2,422	11
196	Granby - - -	72	753	5
197	Brimfield - -	72	1,203	10
198	West Stockbridge - -	74	1,923	10
199	Wales - - -	74	1,030	7
200	Lenox - - -	74	2,043	12
201	Dracut - - -	75	1,695	9
202	Georgetown - -	75	2,231	7
203	Millbury - - -	75	4,741	16
204	Wilmington - -	75	933	10
205	Hadley - - -	75	1,938	11
206	Windsor - -	76	644	6
207	Weymouth - -	76	10,570	18
208	Hatfield - -	76	1,495	10
209	Beverly - - -	76	8,456	16
210	Revere - -	77	2,263	10
211	Monterey - - -	77	635	3
212	Dedham - -	78	6,233	17
213	Stoneham - - -	78	4,890	14
214	Methuen - -	78	4,392	12
215	Westborough - -	79	5,214	16
216	Cheshire - -	79	1,537	7
217	Carver - - -	79	1,039	6
218	Norwood - -	79	2,345	11
219	Greenfield - -	79	3,903	14
220	Plymouth - -	80	7,093	15
221	Wilbraham - -	80	1,628	11
222	Belmont - -	81	1,615	9
223	Holbrook - - -	81	2,130	13
224	Charlemont - -	82	932	6
225	Douglas - - -	83	2,241	11
226	Northampton - -	83	12,172	17
227	Amesbury - - -	83	3,355	16
228	Maynard -	83	2,291	10
229	Natick - - -	84	8,479	15
230	Acushnet - -	84	1,105	7
231	Bellingham - -	84	1,223	8

TABLE IV.—*continued.*

No.	——	Rank.	Population (1880).	Number of Years in which Deaths from Diphtheria and Croup occurred.
232	North Reading - -	84	900	6
233	Montague - - -	85	4,875	14
234	Saugus - -	85	2,625	12
235	Arlington - - -	85	4,100	12
236	Harwich - -	85	3,265	9
237	Fitchburg - -	85	12,429	18
238	Stoughton - -	86	4,875	16
239	North Brookfield - -	87	4,459	16
240	Westhampton - -	87	563	3
241	Cohasset - -	87	2,182	12
242	Southbridge - -	88	6,464	18
243	Rockport - -	88	3,912	13
244	Brookline - - -	88	8,057	16
245	Canton - -	88	4,516	15
246	Gardner - - -	88	4,988	15
247	Southampton - -	89	1,046	9
248	Westfield - - -	90	7,587	17
249	Oxford - -	90	2,604	10
250	Danvers - - -	90	6,598	17
251	Fairhaven - -	90	2,875	11
252	Hingham - - -	91	4,485	15
253	Dudley - -	91	2,803	14
254	Wayland - - -	91	1,962	11
255	Fall River - -	93	48,961	18
256	Dalton - - -	93	2,052	10
257	Peru - - -	93	403	5
258	West Newbury - -	94	1,989	10
259	Orleans - -	96	1,291	8
260	Seekonk - - -	97	1,227	11
261	Heath - -	98	560	6
262	Middleton - - -	98	1,000	9
263	Dennis - -	98	3,288	8
264	Milton - - -	98	3,206	15
265	Winthrop - -	99	1,043	8
266	Groton - - -	99	1,862	7
267	Needham - -	99	5,252	17
	THE STATE - -	100	1,783,085	18
268	Oakham - - -	100	869	5
269	Chicopee - -	100	11,286	18
270	Worcester - - -	101	58,291	18
271	Princeton - -	101	1,100	10
272	Taunton - - -	101	21,213	18
273	Yarmouth - -	102	2,173	6
274	Somerset - - -	103	2,006	11
275	Hyde Park - -	104	7,088	17
276	West Brookfield - -	105	1,917	11
277	Waltham - -	105	11,712	18
278	Milford - - -	107	9,310	16
279	Holliston - -	107	3,098	9
280	South Hadley - -	108	3,538	15
281	Springfield - -	108	33,340	18
282	Braintree - - -	109	3,855	17
283	Whitman - -	109	3,024	9
284	Merrimac - - -	109	2,237	6
285	Mendon - -	109	1,094	5
286	Lawrence - - -	109	39,151	18
287	Groveland - -	110	2,227	9
288	Framingham - -	110	6,235	17
289	Warren - -	110	3,889	15
290	West Boylston - -	111	2,994	13

TABLE IV.—*continued.*

No.	—	Rank.	Population (1880).	Number of Years in which Deaths from Diphtheria and Croup occurred.
291	Watertown - -	111	5,426	17
292	Palmer - - -	112	5,504	17
293	Salem - -	112	27,563	18
294	Northfield - - -	112	1,603	8
295	Ware - - -	113	4,817	17
296	Randolph - - -	113	4,027	14
297	Savoy -	114	715	5
298	Quincy - - -	115	10,570	18
299	Pepperell - -	116	2,348	12
300	Pittsfield - - -	116	13,364	18
301	Lynn - - -	116	38,274	18
302	Malden - - -	118	12,017	18
303	Plympton - -	118	694	7
304	Gloucester - -	118	19,329	18
305	Cambridge - -	118	52,669	18
306	Lanesborough - -	118	1,286	10
307	East Bridgewater - -	118	2,710	11
308	New Bedford - -	119	26,875	18
309	Chelsea - -	119	21,782	18
310	Somerville - - -	120	24,933	18
311	Peabody - -	120	9,028	17
312	Conway - - -	121	1,760	3
313	North Andover - -	122	3,217	12
314	Lowell - - -	123	59,475	18
315	Ashland - -	123	2,394	13
316	Brockton - - -	123	13,608	18
317	West Springfield - -	123	4,149	17
318	Carlisle - - -	125	478	8
319	Russell - - -	126	823	9
320	Boston - - -	127	362,839	18
321	Hanson - -	129	1,309	10
322	North Adams - -	129	10,191	8
323	Lee - - -	129	3,939	15
324	Rowe - - -	129	502	4
325	Monson - -	130	3,758	14
326	Agawam - -	133	2,216	14
327	Everett - -	138	4,159	14
328	Easton - -	140	3,902	10
329	Haverhill - -	141	18,472	18
330	Wakefield - - -	142	5,547	18
331	Huntington - -	146	1,236	12
332	Holyoke - - -	151	21,915	18
333	Hopkinton - -	152	4,601	16
334	Tyringham - -	156	542	7
335	Clarksburg - -	156	724	7
336	Northbridge - -	157	4,053	16
337	Marblehead - -	158	7,467	16
338	Nantucket - -	160	3,727	12
339	Hancock - -	160	642	9
340	Ayer - - -	161	1,881	11
341	Webster - -	164	5,696	18
342	Williamstown - -	165	3,394	12
343	Adams - - -	166	5,591	18
344	Freetown - -	167	1,329	9
345	Spencer - - -	185	7,466	18
346	Florida - -	332	459	8

Avon included in Stoughton,
Bourne included in Sandwich,
Hopedale included in Milford,
North Attleborough included in Attleborough,
Millis, included in Medway.

The Relationship between the occurrence of Diphtheria and the movement of the Sub-soil Water.

BY

Matthew A. Adams, F.R.C.S., Maidstone.

In the latter part of the year 1884, I commenced a series of observations on the fluctuation of the sub-soil water at Maidstone; these have been continued day by day until the present time.

Except for general scientific interest, these observations, in the first instance, had no special point; nevertheless the hope was always entertained that very probably something of a practical value, in course of time, might issue therefrom.

It so befell that after they had been in progress some 3½ years, namely at the beginning of 1888, there commenced what in result has proved to be a serious and prolonged epidemic of diphtheria, within the bounds of the borough of Maidstone, for which urban sanitary district I am medical officer of health. The epidemic continued to prevail throughout the whole of the three years 1888–90, previous to which, although there had been occasional cases, so far as my 13 years' official experience of the borough of Maidstone goes, diphtheria has never prevailed to any serious extent; in point of fact the total number of cases during the three years 1885–87 were 12 only, against 171 in the three epidemic years 1888–90, so that the six years of our sub-soil water records cover two periods, one of comparative freedom from diphtheria, and the other of its epidemic prevalence,—each of three years' duration.

In the earlier stages of the epidemic it did not appear that personal contagion bore any share in the propagation of the disorder; in short for the space of 42 weeks the early cases were entirely sporadic, and distributed as distinctly, and as widely as possible, over various distant parts of the town, without there being, as far as could be ascertained, any connexion between one case and another, and it was not until the 43rd and 45th weeks of 1888 that there was any evidence of a tendency for the disease to become localised, this tendency first manifested itself in the extreme west of the borough. Between the 47th week of 1888 and 7th week of 1889 there was a second localisation in the extreme east of the borough; and between the 8th and 17th week of 1889, a third locality to the north-west, but again quite distinct from the two former, became the focus of a third and independent localisation.

The epidemic reached its height between the 23rd and 24th weeks of 1889, that is about the 76th week from its commencement; since then, with sundry pauses, it has continued throughout 1890 into the present year.

The number of cases, deaths, and rates of fatality in a population of 32,000 for each of the three years 1888–90 were as follows:—

Year.	Cases.	Deaths.	Death Rate per cent.
1888 -	41	12	29·3
1889 -	58	29	50·0
1890 -	72	11	15·3
Total -	171	52	30·4

It has been my endeavour all along to collect every useful fact connected with this epidemic; and the purport of the present communication is to bring to the notice of the Congress the results of these observations, chiefly because they appear to show a relationship between the prevalence of diphtheria and certain meteorological occurrences, more particularly those relating to the height and movements of the sub-soil water.

On the present occasion, time will not permit of my attempting to go deeply into detail. I must content myself with observing, that the fullest particulars have already been published in my report upon the health of Maidstone for 1889, and that my inquiries embraced minute particulars concerning all such matters as it appeared to me were likely to throw any light upon the etiology and mode of propagation of this disorder. They included investigations into the milk and water supplies, school attendance, concurrent diseases among persons and brute animals, the ordinary sanitary conditions of the dwellings and surroundings of the victims, and the various meteorological passing events. In none of these inquiries was anything whatever discovered to incriminate milk or other food supply, nor associated diseases among brute animals, but in almost every primary case, the one fact that stood out clear and distinct, was the existence of some serious sanitary defect, more often than not, connected in one way or other with imperfect drainage; and in several instances the history of the invasion was so circumstantially associated with a specific nuisance that it was impossible to regard the connexion as other than cause and effect. Of some of these occurrences I have published detailed accounts in the report already referred to.

Among the impugned conditions, not a few relate to pollution of soil. It being, at the present time, my more especial purpose to invite your attention to, and to concentrate my remarks upon the consideration of an apparent relation between the occurrence of diphtheria and condition of the soil, I will at once pass to a review of certain of the meteorological observations, which I suppose to be active agents in the production and propagation of the disease; these, as already mentioned, were begun in 1884, and have been continued daily until the present time. My plan has been to plot upon one and the same chart all that concerns atmospheric pressure, temperature, and moisture; wind and sunshine, rain and sub-soil water; general mortality, and the time incidence, as well as

it could be fixed, of the commencement of each of the diphtheria cases.* The annexed diagram is an extract from the more extended records, and is designed to bring the whole six years' observations conveniently and collectively under the eye, so far as regards the behaviour of the sub-soil water in relation to the occurrence of diphtheria. To accomplish this the daily records have been compressed into weekly periods, in order that a comparison of one year with another, and parts of a year with similar parts of other years, may readily be made.

In the diagram the year is divided into quarters, and corresponding therewith beneath each quarter is inscribed the rainfall in inches. The depth of the sub-soil water from the surface for any given period can be measured by the scale of feet at one end, and the range of movement of the level of the water during each successive week is indicated by the size of the shaded blocks, so that one can see at a glance when and what alterations of level had taken place at any given time, how much or how little the change had been, and whether rapid or slow.

Accordingly we find as follows :—

				Feet.
The maximum depth of water from the surface			=	17·7
,, minimum	,,	,,	=	15·5
,, total range	,,	,,	=	2·2
,, average depth		,,		16·68

Looking at the diagram as a whole, the first thing that strikes one is a similarity between the curves for the years 1885, 1886, and 1887 ; this is very obvious, for in each of those years we find a single high tide and a single low tide; the high tide coming at the early part of the year, and the low tide some time about the junction of the third and fourth quarters. Far different, however, are the curves for 1888, 1889, and 1890. In these later years all order seems to be lost, each year presents several high and several low tides, the maximum never being so high, nor minimum so low, as in the three former years, from which it may be inferred that the soil during the three earlier years was more thoroughly washed during the colder seasons, and better drained, dried, and aërated during the hotter seasons; whilst on the other hand, during the last three years the soil must have been kept in a condition of more or less stagnant saturation.

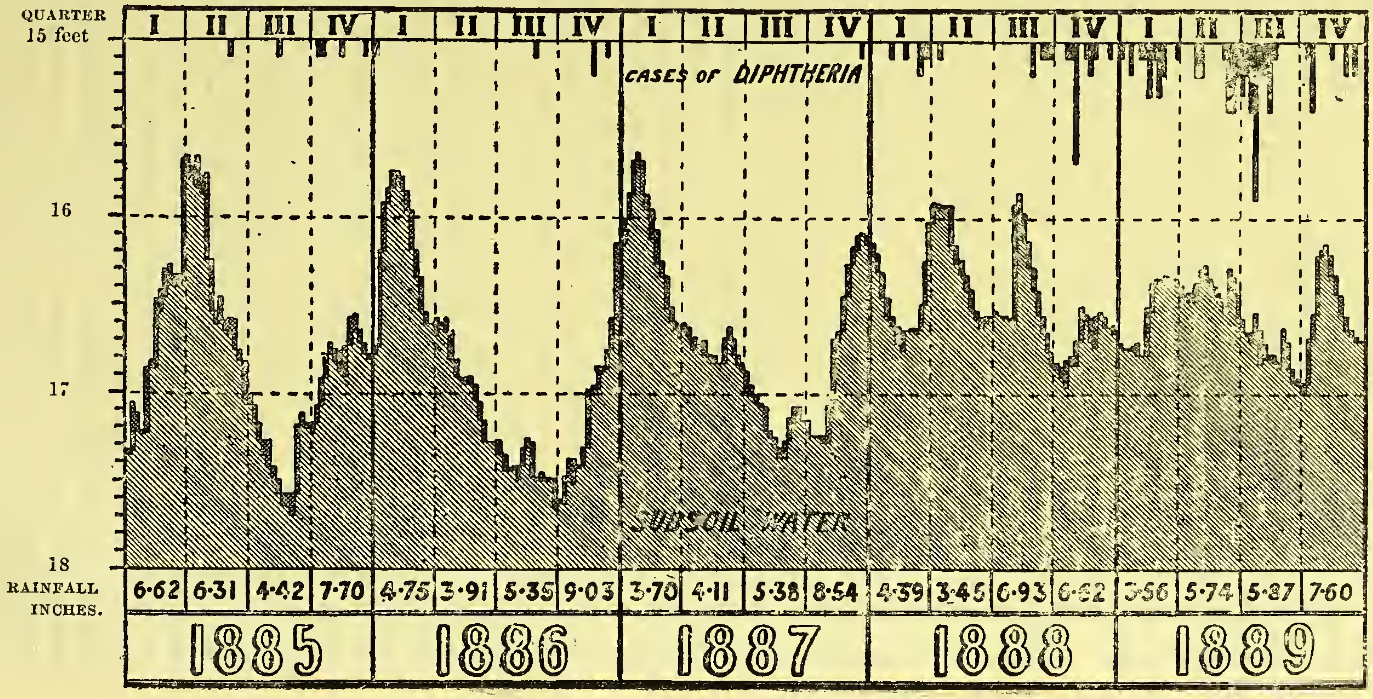
Moreover it is to be observed that the coincidence of tide and season that prevailed in the earlier years was in great measure reversed in the later ones; for example, in the middle of the first quarter of 1888 there came a low tide when we had reason to expect a high tide, and in the middle of the third quarter the highest tide of the year when we might have looked for the lowest; this was followed by nearly 12 months of comparative stagnation, in which the typical features of the winter's

* The diagram inserted has already done duty in my report for 1889, and consequently does not include the chart for 1890, but so far as it goes it serves the purpose of illustrating the text. The 1890 chart (exhibited at the Congress) resembles those for 1888 and 1889.

DIPHTHERIA in relation to height and fluctuation of SUBSOIL WATER at MAIDSTONE.

The Cases of Diphtheria are represented in black, and the number of cases that originated in the respective weeks is indicated by the sizes of the solid blocks.

The Subsoil Water Level is represented by shading, and the amount of fluctuation for the respective weeks is indicated by the size of the double-shaded blocks.



washing and summer's aëration of the earlier years were not to be found. With the autumn of 1889 there came, too soon may be, a welcome rise, which gave hope that the annual purge would be accomplished in proper season; but this was not to be, by the end of the year the water had sunk to a level suited to midsummer rather than midwinter, consequently there was total failure of soil-washing during the winter months of 1889–90, and, as time went on, in like manner we were disappointed of the summer's aëration, in place of which there came a most mischievous rise in July. So that the characteristics of the sub-soil tide during 1890 were not in accordance with those of the three earlier years, such as we judge to be typical of the more salutary sort.

If now we turn to a consideration of the coincident record of the diphtheria, which in similar fashion is exhibited on the diagram by the solid blocks, we find a corresponding distinction, equally remarkable, between the three earlier and the three later years: during the former very little diphtheria prevailed, during the latter much.

As long as the single high and low tides, in suitable agreement with the cold and hot seasons lasted, all went well, diphtheria was scarce; but so soon as this favourable order of things was interrupted, our fortunes changed, diphtheria began to prevail, and as is shown by the diagram, when this correspondence was most exact, as for example in 1887, there was least diphtheria; on the contrary, with every departure from this type diphtheria cropped up. The starting-point of our epidemic, for instance, coincides with a disturbance of this kind when a low tide had usurped the place of a high one, and was succeeded by a misplaced high tide, the effect of which was to charge the soil with moisture just at a time when it was most important it should be dry. In this manner the annual soil washing that should have taken place during the winter of 1888–89 but did not, and the aëration that ought to have followed in the summer of 1889 but did not, together produced a conjunction of events, according to my belief, favourable to the production of diphtheria. That we may, together, view the facts in the same light, I must ask you to bear with me whilst I state precisely what I suppose to be some of the conditions concerned in this problem. My suggestions are that diphtheria is bred and born in polluted soil, that a damp condition of the atmosphere favours its existence, that in all probability it cannot exist actually submerged in water, immersion would drown it, for there does not appear a tittle of evidence to indicate that diphtheria is ever water-borne, nor does it appear to be easily air-borne, though very contagious, it seems to be so at close quarters only, and probably it is communicated by particulate matter, such for instance as may pass from one individual to another in the acts of coughing, sneezing, or speaking. If therefore it exists in the soil, we must believe that it lives somewhere above the water-level. It seems also probable that drought will kill it, and there can be no doubt decaying albuminous matter is necessary for its existence. In short, everything goes to show that diphtheria is due to a microbe that lives a parasitic life upon dead or decaying animal matter, and that the animal body is liable to be attacked by it, the special phenomena of the disease being the result of

the poison of its excretion. It seems also clear that the organism is aërobic, requiring its just proportion of heat, air, food, and moisture; and it appears to me that at or near the surface of polluted soil is a most likely place to find these conditions best fulfilled.

If this be true, we can imagine a patch of infected soil, thronged in its interstices by colonies of diphtheria microbes, ready to be discharged along with the ground air into the air we breath, when from any cause that ground air is driven out of the soil. Besides the fundamental and therefore the most important influence of the fluctuation of the subsoil-water upon the development of the diphtheria microbe, without doubt, a rise in the sub-soil water may of itself be a direct agent in the distribution of the germs, but I am by no means disposed to think it can be the most effective; my idea is that reduced atmospheric pressure and rainfall are the chief agents of distribution. It needs no argument from me to convince you of the powerful influence reduced atmospheric pressure must have in withdrawing air from the soil, our common sense of smell supplies evidence enough of this; but as respects the effect of rainfall, the method of its operation, may be, is not quite so obvious. That it is pratically very effective in discharging ground air into our houses it appears to me there can be no doubt, more specially when the rain is sudden and copious; for at such times as soon as the outdoor exposed surface that receives the rain becomes temporarily sealed by moisture, the imprisoned ground air is driven laterally beneath protected parts, such as are sheltered by buildings, to find an easy way of escape through the unwetted surface that underlies our houses.

In the study of our records by the light of these views I must ask you therefore to allow me to fix your attention upon these three things:—

The state of the barometer.

The rainfall.

The sub-soil water level.

Now in going through the records carefully, we find many instances of association of diphtheria with one or other, or several of these three effective agents; and if we merely glance at the diagrams constructed from these records, it will be easy to discover typical cases of this sort.

As examples of the effect of reduced barometric pressure, I may point to 31st January, 11th and 15th March, 1888, January, March, November and December, 1890; and of the rise of the subsoil water, March and November, 1888, February, 1889, and especially the sudden rise in June and October, 1889, also July, 1890; and of the effect of sudden rainfall at the end of October and November, 1888, again in February and April, 1889, also same year from 6th to 10th June, and almost daily throughout July and October, and lastly in March, July and November, 1890.

If we analyse the 171 diphtheria cases with the purpose of ascertaining what amount of agreement there was between these several circumstances, we find that in 96 cases there is distinct evidence of coincidence, and of the remaining 75 cases, 48 can be accounted for by direct contagion, 17 by special circumstances, leaving 10 only

unaccounted for; several of which, according to my notes of the cases, were of doubtful character as regards the exact nature of the malady.

No. of Cases.	Coincident with following favouring circumstances.
21	Barometer, Rain, and Water Level.
12	Barometer and Rain.
9	Barometer and Water Level.
8	Rain and Water Level.
14	Barometer.
17	Rain.
15	Water Level.
96	Total Meteriological.
48	Contagion.
8	Drain Overflow.
4	Disturbance of Polluted Soil.
5	Association with Scarlet Fever and Measles.
10	Unaccounted for.
171	Total.

This is but a bare and epitomized record of the facts pertaining to the sub-soil water observations which it has been my purpose to bring to your notice. Stripped of much detail, and all collateral considerations, one cannot expect this record will strike your minds with the force which in the fuller history, the living circumstances, so to speak, as they occurred day by day, have affected mine; but the exigences of the occasion impose upon me the utmost brevity. In the presence of men of such wide fame, whose knowledge and experience in these matters we are all so anxious to profit by, it would ill become me to trespass one moment longer on your time and attention than may suffice to express to you my sense of the honour accorded me of having been permitted to contribute this paper, and my earnest desire that its contribution may serve to stimulate others to pursue a similar line of investigation, in the trustful hope that thereby light may be shed upon the life history of that most mysterious scourge, diphtheria.

A Local Examination of the Difference in Susceptibility to Diphtheria between Old and New Residents.

BY

Charles E. Paget, M.R.C.S., D.P.H., Medical Officer of Health for the County Borough of Salford.

In further consideration of the facts relating to a recent extensive epidemic of diphtheria which prevailed in the Borough of Salford during

the years 1888, 1889, and 1890, the suggestion has been made that, as a contribution to the general pathology of the disease it would be useful to know if any difference in susceptibility to disease could be detected between the old residents of unhealthy places in the borough and the new comers to them. Such differences have been often observed in different countries. I have, therefore, made an effort to discover if similar differenees were observable in different parts of the same town. Unfortunately it was not until late in the year 1888 that special inquiry was made as to the length of residence in their respective houses of the persons attacked with diphtheria. I can therefore only give the facts of residenee as they appeared for the years 1889 and 1890; and I have no evidence as to whether the new comers had moved from other houses in the same neighbourhood or from greater distances. Moreover, the circumstances of an epidemic must, I fear, interfere somewhat with the accuracy of any indications as to the influence of residence, owing to the special increased liabilities to the contraction of the disease which are usually presented in an epidemic period. At the same time the indications, as far as they go, may possess some interest, and for this reason I beg to lay them before the members of this Congress.

I must premise, for the sake of clearness, that there are four principal divisions of the borough of Salford, namely, the Regent Road, the Greengate, the Pendleton, and the Broughton districts. In my official report on this epidemic I showed—

(i.) that diphtheria had prevailed extensively in the borough 30 years previously, when the population was rather less than half its present amount, 198,717, and that the disease had never been absent from the borough during the 30 years following;

(ii.) that the epidemic reported on began about the end of the year 1887, spread chiefly by means of personal infection, was not due to the distribution of any general food supply, and could not be shown to be related to infection from any domestic animals;

(iii.) that the disease could not be shown to have been specially prevalent in localities in whieh the soil had been polluted by having been used for the "tipping" of organic refuse; and

(iv.) that the spread of the disease appeared to have been assisted by such conditions of house-drains and of sewers as had tended to the deposit and retention in them of offensive and infectious matters.

There were special facilities for the infection of the sewers and drains from many very mild cases of the disease in the earliest stages of the epidemic, before its nature had been generally recognised. This fact, together with that of communication by personal infection, are the important points to be borne in mind in connexion with the further special inquiry. As the result of my first inquiry was to establish that it was from one or other of these sources of infection that the disease

principally spread in the borough, the question of the power of resistance of each individual attacked may be dealt with solely with regard to these two sources of infection.

The localisation of cases of diphtheria from the year 1883 was rendered possible owing to local notification of infectious diseases having been in operation from the beginning of that year; and according to the records of that and subsequent years down to the epidemic period, it appeared that the very low-lying portion of the Broughton district, which is bounded on two sides by the river Irwell, was that most constantly affected by diphtheria; that the disease was somewhat concentrated in the much smaller Greengate district, which is also low-lying, and is the oldest part of the borough; and that, until the disease assumed an epidemic form, there was only a scattered distribution of cases in the Regent Road and Pendleton districts. The order of proportional prevalence from highest to lowest down to the year 1888 was, however, as may be seen from the following table—Broughton, Pendleton, Regent Road, Greengate, and the disease was most prevalent where the population was densest in the respective districts.

TABLE I.—Table showing the comparative Incidence of Diphtheria attacks in each of the Four Districts of the Borough during the Years 1883 to 1890.

—	Regent Road District.			Greengate District.			Pendleton District.			Broughton District.		
Estimated to the Middle of the Year.	Population.	Cases of Diphtheria.	Proportion of Cases to 1,000 of Population.	Population.	Cases of Diphtheria.	Proportion of Cases to 1,000 of Population.	Population.	Cases of Diphtheria.	Proportion of Cases to 1,000 of Population.	Population.	Cases of Diphtheria.	Proportion of Cases to 1,000 of Population.
1883	72,128	11	0·15	31,540	13	0·41	45,016	27	0·60	33,267	30	0·90
1884	73,019	41	0·56	31,447	12	0·38	45,725	24	0·52	33,856	22	0·65
1885	73,911	15	0·20	31,353	9	0·29	46,434	7	0·15	34,444	23	0·67
1886	74,802	13	0·17	31,261	5	0·16	47,143	11	0·23	35,032	13	0·37
1887	75,693	25	0·33	31,168	4	0·13	47,852	21	0·44	35,621	33	0·93
1888	76,584	57	0·74	31,075	21	0·68	48,561	56	1·15	36,209	42	1·16
1889	77.476	244	3·15	30,982	120	3·87	49,270	204	4·14	36,797	123	3·34
1890	78,368	240	3·06	30,889	115	3·72	49,979	256	5·12	37,385	82	2·19

TABLE II.—REGENT ROAD DISTRICT.

1889.														
Age.	Under One Year.		1 to 5 Years.		5–20 Years.		20–40 Years.		40–60 Years.		60 Years and Upwards.		At all Ages.	
Period of Residence.	Cases.	Per cent. of Cases in District.	Cases.	Per cent of Cases in District.	Cases.	Per cent. of Cases in District.	Cases.	Per cent. of Cases in District.	Cases.	Per cent. of Cases in District.	Cases.	Per cent. of Cases in District.	Cases.	Per cent. of Cases in District.
Under 1 Month.	–	–	4	1·6	6	2·5	–	–	–	–	–	–	10	4·1
1 to 2 Months.	–	–	3	1·2	4	1·6	6	2·5	1	0·4	–	–	14	5·7
2 to 3 Months.	–	–	5	2·1	4	1·6	1	0·4	–	–	–	–	10	4·1
3 to 6 Months.	–	–	4	1·6	13	5·3	4	1·6	–	–	–	–	21	8·6
6 to 12 Months.	4	1·6	9	3·7	24	9·8	10	4·1	–	–	–	–	47	19·2
1 to 2 Years.	–	–	6	2·5	16	6·6	4	1·6	–	–	1	0·4	27	11·3
2 to 3 Years.	–	–	8	3·3	15	6·1	9	3·7	1	0·4	–	–	33	13·5
3 Years and Upwards.	1	0·4	12	4·9	62	25·4	5	2·1	2	0·8	–	–	82	33·6
Total	5	2·1	51	20·9	144	59·0	39	16·0	4	1·6	1	0·4	244	–

1890.															Total 2 Years, 1889 and 1890.	
Age.	Under One Year.		1 to 5 Years.		5–20 Years.		20–40 Years.		40–60 Years.		60 Years and Upwards.		At all Ages.			
Period of Residence.	Cases.	Per cent. of Cases in District.	Cases.	Per cent. of Cases in District.	Cases.	Per cent. of Cases in District.	Cases.	Per cent. of Cases in District.	Cases.	Per cent. of Cases in District.	Cases.	Per cent. of Cases in District.	Cases.	Per cent. of Cases in District.	Cases.	Per cent. of Cases in District.
Under 1 Month.	1	0·4	6	2·5	6	2·5	2	0·8	–	–	–	–	15	6·2	25	5·2
1 to 2 Months.	2	0·8	5	2·1	2	0·8	2	0·8	–	–	–	–	11	4·6	25	5·2
2 to 3 Months.	1	0·4	3	1·2	1	0·4	3	1·2	1	0·4	–	–	9	3·7	19	3·9
3 to 6 Months.	2	0·8	6	2·5	7	2·9	4	1·7	1	0·4	–	–	20	8·3	41	8·5
6 to 12 Months.	1	0·4	8	3·3	24	10·0	14	5·8	1	0·4	–	–	48	19·9	95	19·6
1 to 2 Years.	1	0·4	15	6·2	13	5·4	9	3·7	1	0·4	1	0·4	40	16·6	67	13·8
2 to 3 Years.	–	–	7	2·9	15	6·2	10	4·2	3	1·2	–	–	35	14·5	68	14·1
3 Years and Upwards.	–	–	15	6·2	33	13·7	14	5·8	1	0·4	–	–	63	26·1	145	29·9
Total	8	3·3	65	26·9	101	42·0	58	24·1	8	3·3	1	0·4	241	–	485	–

TABLE III.—Greengate District.

1889.

Age. / Period of Residence.	Under One Year. Cases.	Under One Year. Per cent. of Cases in District.	1 to 5 Years. Cases.	1 to 5 Years. Per cent. of Cases in District.	5–20 Years. Cases.	5–20 Years. Per cent. of Cases in District.	20–40 Years. Cases.	20–40 Years. Per cent. of Cases in District.	40–60 Years. Cases.	40–60 Years. Per cent. of Cases in District.	60 Years and Upwards. Cases.	60 Years and Upwards. Per cent. of Cases in District.	At all Ages. Cases.	At all Ages. Per cent. of Cases in District.
Under 1 Month.	–	–	1	0·8	2	1·7	1	0·8	–	–	–	–	4	3·3
1 to 2 Months.	–	–	3	2·5	6	5·0	–	–	–	–	–	–	9	7·5
2 to 3 Months.	1	0·8	1	0·8	1	0·8	1	0·8	–	–	–	–	4	3·3
3 to 6 Months.	2	1·7	2	1·7	8	6·7	1	0·8	–	–	–	–	13	10·8
6 to 12 Months.	1	0·8	5	4·2	9	7·5	2	1·7	–	–	–	–	17	14·2
1 to 2 Years.	–	–	9	7·5	9	7·5	4	3·3	–	–	–	–	22	18·3
2 to 3 Years.	–	–	8	6·7	6	5·0	–	–	–	–	–	–	14	11·7
3 Years and over.	–	–	8	6·7	23	19·2	3	2·5	3	2·5	–	–	37	30·8
Total	4	3·3	37	30·8	64	53·3	12	10·0	3	2·5	–	–	120	–

1890.

Age. / Period of Residence.	Under One Year. Cases.	Under One Year. Per cent. of Cases in District.	1 to 5 Years. Cases.	1 to 5 Years. Per cent. of Cases in District.	5–20 Years. Cases.	5–20 Years. Per cent. of Cases in District.	20–40 Years. Cases.	20–40 Years. Per cent. of Cases in District.	40–60 Years. Cases.	40–60 Years. Per cent. of Cases in District.	60 Years and Upwards. Cases.	60 Years and Upwards. Per cent. of Cases in District.	At all Ages. Cases.	At all Ages. Per cent. of Cases in District.	Total 2 Years, 1889 and 1890. Cases.	Total 2 Years, 1889 and 1890. Per cent. of Cases in District.
Under 1 Month.	–	–	3	2·6	3	2·6	..	–	–	–	–	–	6	5·2	10	4·3
1 to 2 Months.	1	0·9	1	0·9	2	1·7	1	0·9	–	–	–	–	5	4·3	14	6·0
2 to 3 Months.	–	–	–	–	3	2·6	1	0·9	–	–	–	–	4	3·5	8	3·4
3 to 6 Months.	1	0·9	2	1·7	7	6·1	1	0·9	–	–	–	–	11	9·6	24	10·2
6 to 12 Months.	1	0·9	4	3·5	11	9·6	1	0·9	–	–	–	–	17	14·8	34	14·5
1 to 2 Years.	–	–	10	8·7	5	4·3	1	0·9	–	–	–	–	16	13·9	38	16·2
2 to 3 Years.	–	–	5	4·3	2	1·7	3	2·6	2	1·7	–	–	12	10·4	26	11·1
3 Years and over.	–	–	13	11·3	25	21·7	3	2·6	3	2·6	–	–	44	38·3	81	34·5
Total	3	2·6	38	33·1	58	50·4	11	9·6	5	4·3	–	–	115	–	235	–

TABLE IV.—Pendleton District.

1889.

Age. / Period of Residence.	Under One Year. Cases.	Under One Year. Per cent. of Cases in District.	1 to 5 Years. Cases.	1 to 5 Years. Per cent. of Cases in District.	5–20 Years. Cases.	5–20 Years. Per cent. of Cases in District.	20–40 Years. Cases.	20–40 Years. Per cent. of Cases in District.	40–60 Years. Cases.	40–60 Years. Per cent. of Cases in District.	60 Years and Upwards. Cases.	60 Years and Upwards. Per cent. of Cases in District.	At all Ages. Cases.	At all Ages. Per cent. of Cases in District.
Under 1 Month.	1	0·5	2	1·0	1	0·5	1	0·5	1	0·5	-	-	6	2·9
1 to 2 Months.	-	-	1	0·5	2	1·0	4	2·0	-	-	-	-	7	3·4
2 to 3 Months.	-	-	1	0·5	2	1·0	-	-	-	-	-	-	3	1·5
3 to 6 Months.	-	-	5	2·4	4	2·0	4	2·0	2	1·0	-	-	15	7·4
6 to 12 Months.	3	1·5	12	5·9	19	9·2	6	2·9	1	0·5	1	0·5	42	20·6
1 to 2 Years.	-	-	14	6·9	11	5·4	5	2·5	1	0·5	-	-	31	15·2
2 to 3 Years.	-	-	9	4·4	5	2·4	6	2·9	1	0·5	-	-	21	10·3
3 Years and over.	-	-	17	8·3	40	19·6	18	8·8	4	2·0	-	-	79	38·7
Total -	4	2·0	61	29·9	84	41·1	44	21·6	10	4·9	1	0·5	204	-

1890.

Age. / Period of Residence.	Under One Year. Cases.	Under One Year. Per cent. of Cases in District.	1 to 5 Years. Cases.	1 to 5 Years. Per cent. of Cases in District.	5–20 Years. Cases.	5–20 Years. Per cent. of Cases in District.	20–40 Years. Cases.	20–40 Years. Per cent. of Cases in District.	40–60 Years. Cases.	40–60 Years. Per cent. of Cases in District.	60 Years and Upwards. Cases.	60 Years and Upwards. Per cent. of Cases in District.	At all Ages. Cases.	At all Ages. Per cent. of Cases in District.	Total 2 Years. 1889 and 1890. Cases.	Total 2 Years. 1889 and 1890. Per cent. of Cases in District.
Under 1 Month.	-	-	6	2·3	3	1·2	1	0·4	-	-	-	-	10	-	16	3·5
1 to 2 Months.	-	-	4	1·6	4	1·6	1	0·4	-	-	-	-	9	3·5	16	3·5
2 to 3 Months.	-	-	1	0·4	-	-	-	-	-	-	-	-	1	0·4	4	0·9
3 to 6 Months.	-	-	7	2·7	6	2·3	2	0·8	1	0·4	-	-	16	6·2	31	6·7
6 to 12 Months.	2	0·8	15	5·9	14	5·5	2	0·8	-	-	-	-	33	12·9	75	16·3
1 to 2 Years.	-	-	19	7·4	21	8·2	6	2·3	-	-	-	-	46	18·0	77	16·7
2 to 3 Years.	-	-	13	5·1	8	3·1	3	1·2	-	-	1	0·4	25	9·8	46	10·0
3 Years and over.	-	-	23	9 0	78	30·5	13	5·1	2	0·8	-	-	116	45·3	195	42·4
Total -	2	0·8	88	34·0	134	52·0	28	10·9	3	1·2	1	0·4	256	-	460	-

TABLE V.—Broughton District.

1889.

Age. / Period of Residence.	Under One Year. Cases.	Under One Year. Per cent. of Cases in District.	1 to 5 Years. Cases.	1 to 5 Years. Per cent. of Cases in District.	5–20 Years. Cases.	5–20 Years. Per cent. of Cases in District.	20–40 Years. Cases.	20–40 Years. Per cent. of Cases in District.	40–60 Years. Cases.	40–60 Years. Per cent. of Cases in District.	60 Years and Upwards. Cases.	60 Years and Upwards. Per cent. of Cases in District.	At all Ages. Cases.	At all Ages. Per cent. of Cases in District.
Under 1 Month.	–	–	–	–	–	–	–	–	–	–	–	–	–	–
1 to 2 Months.	–	–	2	1·6	–	–	–	–	–	–	–	–	2	1·6
2 to 3 Months.	–	–	–	–	3	2·4	–	–	–	–	–	–	3	2·4
3 to 6 Months.	1	0·8	2	1·6	2	1·6	–	–	–	–	–	–	5	4·1
6 to 12 Months.	1	0·8	7	5·7	6	4·9	5	4·1	–	–	–	–	19	15·5
1 to 2 Years.	–	–	8	6·5	9	7·3	1	0·8	–	–	–	–	18	14·6
2 to 3 Years.	–	–	8	6·5	10	8·1	3	2·4	–	–	1	0·8	22	17·9
3 Years and Upwards.	–	–	8	6·5	40	32·5	4	3·2	2	1·6	–	–	54	43·9
Total	2	1·6	35	28·5	70	56·9	13	10·6	2	1·6	1	0·8	123	–

1890.

Age. / Period of Residence.	Under One Year. Cases.	Under One Year. Per cent. of Cases in District.	1 to 5 Year. Cases.	1 to 5 Year. Per cent. of Cases in District.	5–20 Years. Cases.	5–20 Years. Per cent. of Cases in District.	20–40 Years. Cases.	20–40 Years. Per cent. of Cases in District.	40–60 Years. Cases.	40–60 Years. Per cent. of Cases in District.	60 Years and Upwards. Cases.	60 Years and Upwards. Per cent. of Cases in District.	At all Ages. Cases.	At all Ages. Per cent. of Cases in District.	Total 2 Years, 1889 and 1890. Cases.	Total 2 Years, 1889 and 1890. Per cent. of Cases in District.
Under 1 Month.	–	–	2	2·4	–	–	–	–	–	–	–	–	2	2·4	2	1·0
1 to 2 Months.	–	–	1	1·2	3	3·7	–	–	–	–	–	–	4	4·9	6	2·9
2 to 3 Months.	–	–	–	–	2	2·4	–	–	–	–	–	–	2	2·4	5	2·4
3 to 6 Months.	–	–	–	–	1	1·2	–	–	–	–	–	–	1	1·2	6	2·9
6 to 12 Months.	–	–	1	1·2	2	2·4	–	–	–	–	–	–	3	3·7	22	10·7
1 to 2 Years.	–	–	6	7·3	9	11·0	2	2·4	–	–	–	–	17	20·7	35	17·1
2 to 3 Years.	–	–	4	4·9	10	12·2	2	2·4	1	1·2	–	–	17	20·7	39	19·0
3 Years and Upwards.	–	–	8	9·8	21	25·6	6	7·3	1	1·2	–	–	36	43·9	90	43·9
Total	–	–	22	26·8	48	58·5	10	12·2	2	2·4	–	–	82	–	205	–

For the more convenient comparison of the facts in the above tables I have made a short summary showing the chief periods of residence and the per-centages of cases occurring within them :—

Districts of Salford.	Periods of Residence.					
	1 to 6 Months.	6 to 12 Months.	Under 1 Year.	1 to 2 Years.	2 to 3 Years.	3 Years and over.
Regent Road - -	22·8	19·6	**42·4**	13·8	14·1	29·9
Greengate - -	23·9	14·5	**38·4**	16·2	11·1	34·5
Pendleton - -	14·6	16·3	**30·9**	16·7	10·0	42·4
Broughton - -	9·2	10·7	**19·9**	17·1	19·0	43·9

Thus it may be gathered :—

1. That the four districts of the borough showed considerable variations in the incidence of diphtheria attacks in respect of previous length of residence.
2. That the incidence among residents of from one to two years and from two to three years in each of the four districts was smaller than among residents of less than one year or of over three years.
3. That the heaviest incidence of cases was, in the Broughton and Pendleton districts, associated with a three year or longer residence.
4. That in the Broughton district, where the disease was apparently more specially endemic, the number of attacks was proportionately less among one year residents than in any of the other districts.
5. That the Pendleton district presented somewhat similar facts to the Broughton district.
6. That the Regent Road and Greengate districts both showed a remarkable incidence of the disease, equal to more than one-fifth of the total incidence in those districts, among residents of less than six months standing, and a smaller per-centage of attacks among residents of three years and upwards than did the other two districts.

These indications taken in conjunction with the results of previous inquiries—namely, that the most probable methods by which the spread of the disease was effected were personal intercourse and the infection of faulty sewers and drains, and that it was not due to any other specially serious insanitary condition affecting particular portions of each district, unless the special liability of Lower Broughton be excepted—oblige one to look into the general differences of the four districts.

The chief feature of difference between the districts is the relation of their population to their respective acreage. The density of population per acre is, in the Regent Road district, 73·6; in the Greengate district, 117·2; in the Pendleton district, 20·7; and in the Broughton district, 26·2. While, moreover, the Greengate district is practically completely built over, and the Regent Road district is nearly so, the

Pendleton and Broughton districts contain considerable areas not yet built upon, and are better ventilated.

Another notable difference between the districts, doubtless in part dependent on density of population and on ventilation, occurs in their general mortality rates. While the Regent Road district has an average general death-rate of about 27·4 per 1,000 of population, the rate in Greengate is about 31·4, in Pendleton 23·6, and in Broughton 19·2. This variation in general district mortality corresponds roughly with the general sanitary differences of the four districts in respect of ventilation and facilities for change of air. So also, where ventilation of inhabited portions of the borough was least effectual, or where the inhabitants could least easily obtain fresher air in open spaces, there the average length of residence before an attack of diphtheria was generally found to be shorter. In other words, as the people of a district were more subjected to the continuous influence of their insanitary surroundings, they were found less fitted to resist the infection of this zymotic disease.

The result then which I think that I have been enabled to arrive at in this inquiry is that a shorter average period of residence before an attack of diphtheria was observed where the general mortality rate was highest, and *vice versâ ;* that, in fact, the relative incidence of diphtheria during an epidemic period, in respect of length of residence, was dependent to no small an extent on general sanitary circumstances.

I should have liked to have made this inquiry more complete by calculating the proportions of persons infected at particular periods of residence as against the total population resident for like periods in the several districts, but the figures have not been attainable, and I have preferred not to guess at them. I should like, too, to think that some of the figures arising from this investigation support in some degree a belief, which I hold strongly, that residence in infected places *does* confer some measure of immunity similar to that given by repeated inoculations of weakened virus ; but the inquiry has necessarily been of too limited a character to justify my claiming that for them.

I shall be satisfied if only this line of inquiry be considered a useful one, and worthy to be followed out more completely in a general and official investigation as to the remarkable prevalence of diphtheria in this country.

DISCUSSION.

Prof. d'Espine (Génève) said :—*De l'importance de la désinfection de la bouche et du pharynx au point de vue de la prophlyaxie de la diphtérie.* 1. La prophylaxie de la diphtérie doit s'inspirer des récentes recherches bactériologiques qui démontrent la présence du bacille de Loeffler dans les fausses membranes et son absence partout ailleurs. 2. La désinfection des premières voies (nez, bouche, pharynx, etc.) peut être un moyen de guérison chez un dipthéritique dont l'infection générale n'est pas trop avancée. 3. Cette désinfection est en même temps le moyen le plus

efficace d'empêcher le malade de devenir une source de contagion pour son entourage. 4. La désinfection des premières voies constitue la précaution la plus efficace à recommander aux personnes de l'entourage du malade. Nous pensons que cette opération, si elle est bien faite, permettra de restreindre la durée de l'isolement du malade et des personnes suspectes de son entourage. 5. Quels sont les bactéricides les plus efficaces à opposer au bacille de Loeffler? Les expériences que nous avons faites en 1889 avec le Dr. Marignac (voyez Revue Médical de la Suisse romande du 20 Janvier 1890) nous ont démontré que le contact pendant cinq minutes d'une culture du bacille diphtéritique avec les désinfectants suivants a suffi pour la rendre stérile: *a* La solution de sublimé à 1/10,000. *b*. L'acide salicylique à 1/2000. *c*. Le jus de citron, etc.

Par contre les désinfectants suivants, employés de la même manière, sont restés sans effet: *a*. L'acide borique à 4 %. *b*. Le chlorate de potasse à 5 %. *c*. L'eau de chaux, etc.

Parmi ces désinfectants nous avons choisi, dans notre pratique, l'acide salicylique en solution à $1\frac{1}{2}$ % et à 2 %, à cause de son innocuité et de son action curative dans toutes les angines simples et notamment dans l'angine scarlatineuse qui ouvre souvent la porte au bacille de Loeffler.

Notre pratique, ainsi que celle de plusieurs de nos confrères de Génève, est également favorable aux irrigations salicylées naso-pharyngiennes, répètées d'heure en heure contre l'angine diptheritique dans le cas où ce traitement peut être institué avant que l'intoxication générale soit trop avancés.

En tout cas ces irrigation salicylées sont à nos yeux la mesure prophylactique la plus importante à ordonner contre la contagion de la diphtérie.

Dr. J. W. Tripe (Hackney) said he had been Medical Officer of Health of Hackney for 35 years, and had had much experience in diphtheria, as all the deaths and lately all the cases had been investigated as to causation and removal. As regards the effects of good drainage, he would say that his experience is that it has little effect except in improving the general health and diminishing the chances of infection by the poison. The table produced by Dr. Seaton showed that very strongly. He believed the infection was spread by actual contact, and on this point had found that closing the playgrounds was as effectual as closing the schools. The removal of cases as speedily as possible to the hospital, the use for the infected secretions of rags, which should be burnt; the disinfection of rooms and clothing, and other means for destroying the infection itself are the chief means for preventing the spread of diphtheria. Overcrowding of a district did not seem to have so much effect, whilst overcrowding of a house had, as it assisted direct infection. Disturbance of made soil, such as collections of dust, even if made years ago, had been an immediate precedent of an outbreak.

Dr. Günther (Dresden) said:—Im Konigsreiche Sachsen hat die Zahl der durch Diphtherie veranlassten Todesfälle seit dem Jahre 1884 bis jetzt stetig abgenommen; von 7,855 in gedachtem Jahre = 252 : 100,000 Lebenden, auf 3,500 in Jahre 1890 = 101 : 100,000 Lebenden. Ob diese erfreuliche Abnahme eine Folge der mannichfachen sanitären Verabricht-ungen ist, die seit jener Zeit bei uns vorgenommen worden sind, oder ob als Heerschaft der Diphtherie das im vorigen Jahrhundert in Europa und Amerika etwa 40 Jahre dauerte, dann durch die primäre Larynxcroup völlig verdrängt wurde, und erst seit dem Jahre 1861 in Sachsen wieder

auftritt, aus unbekannten Ursachen anfängt sich ihrem Ende zuzuneigen, vermag ich nicht zu sagen.

Dr. Janssens (Bruxelles) said:—Utilisant les documents de statistiques sanitaires comparés que la ville de Bruxelles, qu'il a l'honeur de représenter au Congrès, publie chaque semaine depuis qu'elle a été usage des premiers Congrès internationaux de statistique et d'hygiène, Dr. Janssens exposait dans un série de diagrammes la mortalité relative causée dans 50 villes d'Europe et d'Amérique par le croup et la diphtérie depuis l'année 1875 jusqu'à 1890. La mortalité est prélevée pendant le premier semestre de l'année par la même affection transmissible. Il montre la prédominance constante de la diphtérie dans certains pays et l'immunité relative dont jouissent certains autres, tout en exprimant les réserves nécessaires au sujet de l'inexactitude diagnostique de la cause de mort dont il s'agit.

En étudiant ces tableaux, il s'est demandé si l'influence de race ne jouit pas un rôle dans la prédisposition à la diphtérie; il est juste d'admettre cette supposition, dont il a trouvé une sorte de confirmation dans un diagramme qu'il a dressé et qui montre à l'assemblée la prédominance de la maladie dans les arrondissements et dans les provinces flamandes de son pays, tandis que les arrondissements et provinces habitués par la race wallone ou français, se groupent ensemble au bas du tableau graphique, c'est à dire, dans la situation la plus favorable. Il fait remarquer que les arrondissements mixtes, c'est à dire, occupés par les deux races, à peu près dans la même proportion, occupent une position intermédiare dans le tableau.

Il appellait l'attention de ses collègues des divers pays sur l'opportunité de se livrer aussi à des recherches sur l'influence de la race.

L'orateur croit devoir terminer en rappelant les observations qu'il a fait au sujet de la diphtérie dans l'exercise de ses fonctions d'Inspecteur en chef de l'hygiène publique. Il a remarqué que les quartiers les plus populaires ne donnent pas absolument le plus forte mortalité pour la diphtérie, il n'a jamais constaté de foyers morbides dans la ville de Bruxelles, mais toujours de cas isolés, éparpillés; la classe pauvre ne donne pas un nombre de victimes sensiblement plus élevé que la race aisée. L'hygiène publique a seulement eu pour résultat de diminuer la durée et la violence des épidémies récentes de la diphtérie.

Dr. Thursfield (Shrewsbury) said:—During the last eighteen years I have been called upon to investigate numerous outbreaks of diphtheria in several counties in which that disease is prevalent, and I have long ago arrived at the conclusion that the ordinary accepted ideas as to the etiology of the disease are onesided and misleading. Most of the speakers to-day have referred to anomalies met with in connection with this disease, and one of the most important of these is the fact of its general increase in spite of sanitary improvements. I believe one of the explanations of this failure to be that due significance is not attached to the dissemination of the disease by very mild, medically unattended, and therefore not notified, cases generally acting through school agency. The real key to the anomaly of the disease I believe, however, to be that more importance should be attached to the fact that the chief influence favouring the incidence of the disease is personal susceptibility and that local conditions act chiefly by producing a condition of system favourable to receive the germ when brought in contact with it, especially a congested condition of the mucous membrane of the throat.

Dr. Hewitt of Massachussetts has laid considerable stress on the connection of the disease with damp houses; thirteen years ago in a series of papers which I contributed to the "Lancet" on diphtheria, I stated that I believed that diphthcria was as closely connected with structural dampness of habitation as typhoid fever with sewer gas, and it is gratifying to find the same conclusions arrived at by an independent observer 5,000 miles away. With reference to what Dr. Abbott of Massachusetts has said as to the frequently prolonged period of infection of the disease, I have seen similar instances in this country, and some of these cases have been most remarkable, but may, I think, be explained by the faet that diphtheria is, like typhoid fever, a disease subject to relapses sometimes after apparent recovery, and that a recandescence of the disease is accompanied by a recandescence of the infective intensity, though in the most remarkable case of prolonged infection I have ever met with, there was no apparent recandescence of the disease.

With reference to Mr. Adams's paper on the assumed connection between the rise and the fall of the subsoil water and outbreaks of diphtheria, whilst we must all admire the laborious nature of the work and the complete manner in which the observations had been made, I cannot but feel that it will prove one of those hasty generalisations with which sanitary history is replete. We all know that in investigating diphtheria epidemics under conditions favourable for tracing its spread, the infection is, in an overwhelming number of instances, plainly traceable to direct personal infection, and we may infer that the same influences are at work in epidemics under more complicated conditions of society; and it is obvious that unless Dr. Adams has been able to eliminate the great proportion of cases of personal infection his conclusions are valueless. Personally, I think it will prove that the rise in the subsoil water and the increase of diphtheria were merely concurrentcir cumstances, and they may also have been concurrent with a seasonal increase of catarrhal affections, in which case the local presence of active diphtheria would account for the temporary inerease of the disease.

Dr. Escherich (Prag) said :—Die Erforschung der Verbreitung der Diphtherie muss vom kranken Menschen ausgehen und zunächst die Wege der Uebertragung des specifischen Bacillus in's Auge fassen. Dieses Studium wird erschwert durch die grosse Verschiedenheit im klinischen Bilde der Krankheit. Es ist bekannt, das es ganz ähnlich aussehend membranöse Anginen gibt, die nicht durch den Diphtheriebacillus hervorgerufen sind. Weniger bekannt ist, dass virulente Dipthcriebacillen auf der Rachenschleimhaut in grosser Menge vorhanden sein können, ohne das Membranen zu sehen sind. Es bedarf zur Membranbildung einer besonderen Disposition der Gewebe; die selbst wiederum im Laufe der Erkrankung schwindet. Bei jungen Kindern ist diese Disposition meist vorhanden, bei älteren Kindern und Erwachsenen scheint sie dagegen öfter zu fehlen und man findet bei diesen als Folge seiner Ansteckung mit diphtheritischem Virus eine katarrhalische Angina ohne Belag. Die bakteriologishe Untersuchung der Schleimhautoberfläche ergibt zahlreiche Colonien virulenter Diphtheriebacillen.

Die Bedeutung dieser auf diphterischer Infection beruhenden Anginen, die für den Traeger selbst meist ganz ohne Symptome verlaufen, liegt vorwiegend darin, dass sie im Stande die Diptherie zu verbreiten, wie ich dies noch kürzlich in meinem Spital zu beobachten Gelegenheit hatte. Eine an ciner solchen Angine leidende Wärterin inficirte vier

Kinder der Abtheilung, die mit echter membranöser Diphtherie erkrankten.

Die locale antiseptische Behandlung ist gegenüber diesen noch nicht von Membranen umhüllten Bacillen nöch wirksamer als im Laufe der Erkrankung selbst. Ich konnte nachweisen, dass die Zahl der Bacillen unter Application eines Sprays mit starken antiseptischen Lösungen (1 ‰ Sublimat, 3 % Carbol) rasch abnahm und habe auch bei der ausgebrochenen Erkrankung sehr güstinge Erfolge von dieser Behandlung gesehen.

Dr. Sonsino (Pisa) said :—Je me trouvais à bord d'un grand *Steamer* qui faisait le voyage d'Italie directement pour Montevideo ; avant de passer dans l'Atlantique ils se sont dévelloppés des cas de diphtérie avec scarlatine, qui en peu de jours arrivèrent au nombre d'une vingtaine. Le vrai isolement des malades était impossible, et bien outre toutes les mesures de désinfection et de destruction des objets des malades, j'ai conseillé l'usage général de gargarismes avec du vinaigre : et sur plus de 600 émigrants je n'eus à regretter une propagation majeure de la maladie dans le cours du voyage qui fut accompli en 19 jours, et je n'ai eu à regretter que la perte de deux petits enfants, les premiers atteints, pour lesquelles on a recours à moi lorsque la maladie était déjà dans un état désespéré.

The following *Resolution,* proposed by Dr. Seaton, seconded by Dr. Tripe, and supported by Mr. Sydney Turner, was then put to the meeting, and *carried nem. con.* :—

That this Section urges the European Governments to make a comprehensive and systematic inquiry into the causes of diphtheria.

On the need of Special Measures for the Prevention of Consumption.

BY

ARTHUR RANSOME, M.A., M.D., F.R.S.

That consumption is both curable and preventable will be acknowledged at once by all medical men who have had any experience of modern methods of dealing with the disease. But this truth would hardly seem to have made its way into the public mind, and if we are to judge from the excitement that was roused by Dr. Koch's announcement of his supposed discovery of a cure, it would seem that many even of the medical profession are not very firm believers in the efficacy of ordinary methods of treatment.

It may be necessary, therefore, to state that its curability is attested (1) by the reports of many pathologists as to the presence of evidence of healed phthisis in a large proportion of bodies examined after death in public institutions. Many thousands of such examinations have now been made and the results show that from 25 to 50 per cent. of persons dying

from other diseases than phthisis give signs of spontaneous cure of tubercular disease. (2) The testimony of all the most eminent modern physicians is to the same effect, thus Dr. James Pollock, Dr. C J. Williams, Dr. Austin Flint, Dr. Douglas Powell, amongst English observers, and many others, from Niemeyer to Virchow, all concur in the opinion that consumption is distinctly curable.

From my own observation, both in private practice and at the Manchester Hospital for Consumption, I have arrived at the conclusion that, where all the necessary conditions of treatment can be fulfilled, consumption is decidedly a manageable disease; and although there are some constitutions so feeble, or so vulnerable by the organism, that the disease spreads through the body after one infection, yet in the large majority of cases a fatal issue is brought about not by one or two, but by repeated invasions of the bacillus derived from the unhealthy environment in which these persons are obliged to live.

With regard to the preventability of the disease we have also a strong basis for our assertion.

1st. In the marvellous results that followed the improved drainage and ventilation of the barracks of the British army in all parts of the world. Before the year 1854 the mortality from lung disease amongst the picked population of these dwellings was a scandal to the nation, and was enormously greater than that of the ordinary inhabitants of our towns, especially in the battalions sent to warm climates, such as those of India, Ceylon, the West Indies, the Mediterranean, &c. Thanks to the above-mentioned measures it now stands at from one-third to one-tenth of its former rates.

2. The influence of improved drainage has been shown by Dr. Buchanan, in his table of towns, contrasting the mortality by phthisis and other diseases before and after the introduction of improvements in this direction,

3. And, lastly, by the reduction of the general phthisis rate of the country from 2,602 per 1,000,000 in 1867 to 1,542 per 1,000,000 in 1889.

It can hardly be doubted that the saving of 30,000 lives every year, from this cause alone, which is implied by these figures, is due to the sanitary improvements that have been steadily going forward since the passing of the beneficent Public Health Acts of 1868 and 1875. But if consumption is preventable, there must exist a very large proportion of the population to be protected from the disease. It has been calculated that there are at least 150,000 sufferers from phthisis constantly present amongst us, and we may add to these persons not only an unknown number of susceptible individuals who have not taken the disease, but also the large number of cases of cured phthisis.

The fact that consumption is curable, and that a certain large proportion of persons survive after one or more attacks of the disease, adds, in truth, greatly to the importance of preventive measures; for it increases the number of susceptible persons who have to be protected from its ravages. These persons have not only been proved to be vulnerable by the organism, but their constitution has been impaired,

their injured lungs are less elastic and more ready to harbour the bacillus, and to nurse it into active virulence. Such patients also naturally shrink from the only certain antidote to the poison, a plentiful supply of fresh outdoor air. Believing, as most of them do, that their ailment has arisen, as indeed it often does, from a chill, they strive to avoid this accident by the worst means that they could adopt, namely, by shutting themselves up in close rooms, already loaded with organic impurities, and often charged with virulent forms of the germs of such diseases as pneumonia, catarrh, and even of tubercle itself. They keep their bodies over-clothed, heaping upon their chest coverings that reek with impurity, and that are often themselves a source of pestilence. These persons are thus peculiarly liable to a recurrence of the disease. There exists thus a large mass of preventable disease to be dealt with by sanitary authorities, more in amount than that of any other preventable disorder. It exceeds even that from all the zymotic class put together, for whilst epidemic diseases of all kinds now kill only about 45,000 persons annually in England and Wales, phthisis and other tubercular complaints carry off no fewer than 70,000.

The chief means for the prevention of tubercular disease are also not difficult to find when we fairly consider the chief sources from which it spreads. I do not make light of the many predisposing causes of the disease, the weak constitutions inherited from parents, the tendency to disease acquired by injury to the lungs by irritating dusts, or other substances derived from manufactures; by stooping or constrained postures during work; the catarrhal pneumonias and other chest diseases due to exposure to cold and damp; the insufficient and innutritious foods, and so on; but if we are to prevent the entrance of the organism into these enfeebled bodies, the supply of the specific microbes from without must be cut off.

We may, perhaps, be unable to prevent the rare forms of infection by direct transmission from the mother, or by personal intercourse, but the case is quite otherwise with such sources of the disease as the ingestion of the milk or flesh of tuberculous cattle, or the inhalation of tuberculous dust. Both these should be carefully guarded against, and we may fairly appeal to our medical police to shield the population as much as possible from these dangers. It would probably not be difficult for sanitary authorities to prevent the first of these evils. It would simply be necessary to have more thorough and more scientific inspection by experts of both Meat Markets and dairy farms, and there would need to be greater solidarity between urban and rural authorities than now exists.

But the case is quite different with the prevention of infection by tuberculous dust. All the chief authorities on tubercle are agreed as to the gravity of this source of danger. We have the direct researches of Koch, Bollinger, Galtier, and others as to the prolonged vitality of the bacillus in tuberculous sputum. Cornet has shown also that the sweepings from the walls of sick rooms and of hospitals will convey the disease, and I have myself proved that in an insanitary house in Ancorats and in other unhealthy areas, sputum will retain its virulence for two and a half months or even longer.

The evidence also is very strong that the spread of phthisis is greatly promoted by residence on damp soils, or in ill-ventilated rooms. On the former point I need only mention the researches of Bowditch and Buchanan, confirmed by the Registrar-General of Scotland and by Dr. Haviland. With regard to the latter also we have an abundance of evidence from Dr. Farr, Dr. Parkes, Sir J. Simon, Sir Douglas Galton, Drs. Nevin and Tatham, and many others. It is also extremely probable that infection once introduced into a house clings to it for a length of time, for whilst direct or mouth-to-mouth infection is extremely rare in this climate in well-ventilated rooms, the records of the Collective Investigation Committee of the British Medical Association give many instances in which the disease has recurred again and again in certain unhealthy houses. My own observation in Manchester and Salford, and those of Dr. Irwin in Oldham, and of Dr. Flick in Philadelphia, point to the existence in towns of tubercular areas and infected houses.

Under these circumstances it seems to me that the duty of sanitary authorities is clear. They should regard phthisis as a disease to be dealt with on precisely the same lines as the analogous diseases typhoid fever, cholera, and leprosy, diseases, namely, which are slightly, if at all, directly contagious, but which spread by material thrown off from the bodies of the patients. The means to be employed to this end would also be very similar, for they would be the time honoured methods of (1) Notification of cases. (2) Disinfection. (3) Hospital accommodation; and (4) General sanitary measures, such as ventilation, drainage, and re-construction of unhealthy areas.

1. *Notification.*—At first it may sound somewhat novel to demand that a slowly progressing ailment like phthisis should be notified, as if it were liable to become an epidemic disease; but, after all, we may fairly inquire whether the purpose of notification is not the prevention of any disease that may be arrested by early intelligence of its existence being sent to the health officer; nor would there be much difficulty in obtaining the notification of phthisis. Although phthisis is not directly contagious, there would be nothing unreasonable in classing it with other diseases that need special measures to prevent its spread. Under the recently passed Notification of Diseases Act, many local authorities have included enteric fever in their schedules, a disease precisely similar, in the attribute that it is rarely, if ever, directly infectious, but which spreads mainly by means of excretions from the patients suffering from it. There would also be nothing strained in interpreting the words of the Public Health Act of 1875, in the clauses relating to infectious disease, so that they should mean that special measures must be put in force to prevent persons so situated from sowing around them the virulent particles coughed up from their diseased lungs. It would, doubtless, be necessary to take special precautions to prevent the repeated notification of the same case of phthisis, but by means of a careful register I have no doubt that this could be accomplished. The organization of our sanitary police is sufficiently complete to enable it to keep such cases under surveillance and control.

2. *Disinfection.*—After receiving notice of a case of tuberculosis, the next step to be taken by a local authority would be to ascertain whether proper care is, or can be, taken to prevent injury to the public health. In the case of well-to-do persons the information given by the medical attendant would be sufficient, but where the case is that of a poor person it should be visited, and the local authority should see to the regular cleansing and whitewashing of the premises, and to the disposal of excretions, especially of the expectorated matter. If necessary, disinfection by sulphur, and the stoving of clothes, should be carried out. Paper spittoons that can be burnt should be insisted upon. After death also, measures should be taken for the cleansing and disinfection of house, bedding, and clothes.

3. *Hospital accommodation.*—There would next come the question of the propriety or possibility of removing the sick person to hospital. So long as he (or she) could work, and so long as he would consent to use the necessary means for destroying the infective material, it would be unnecessary to do more than I have already indicated; but when the patient becomes unable to follow his employment, and the family are obliged to seek for assistance from the parish, he has a claim to be received into the workhouse hospital, and such an asylum should be offered him, and should be made as little humiliating and as free from ignominy as possible. I would also put in a plea for those who are not reduced to pauperism, but who could be removed to hospital to receive appropriate treatment in the wards. Towards the close of their illness, persons who live in close, confined dwellings become a serious source of danger to the rest of the family, and as they are without proper lodging and accommodation for the safe treatment of such a disease, I would submit that it would be a legitimate expenditure on the part of local authorities, if they were to provide male and female wards for the reception of such cases in connexion with their hospitals for infectious diseases. Although consumption is not directly infectious, its products are undoubtedly infective under certain conditions, such as have been mentioned, and local boards would be taking the right measures for preventing the spread of disease if they were to make such provision; there are probably few exanthematous diseases that can be so easily and effectively controlled.

4. But it is probably to *general sanitary measures* that we must look for any large reduction in the rate of mortality from tubercle. It has been found that deep and thorough drainage of the subsoil will greatly diminish this mortality. In the case of Salisbury, as you are probably aware, it was reduced by one-half, and similar reports have come from other towns, and, though the same result has not always been obtained elsewhere, there can be no doubt as to the importance both of draining and concreting the foundations of dwelling-houses, so as to prevent organic vapours from rising along with the ground air into living-rooms.

I think, therefore, that we shall not be far wrong in ascribing to the better drainage of the country a large part of the recent diminution in the death-toll levied by phthisis.

Ventilation, again, seems effectually to stop infection from tubercle, when it has been thoroughly carried out. It is well known that the sole measures that so greatly reduced the death-rate in the army, between the years 1854 and 1868, were the better drainage and ventilation of the barracks. Even before the discovery of the infective character of tubercular sputum, and therefore before any special means for their disinfection were employed, it was proved that the excellent ventilation of the wards of our great hospitals for consumption effectually preserved the attendants upon the sick from any harm. I believe, also, that it is extremely rare in this country for consumption to be conveyed from person to person even under circumstances where there exists the closest personal contact, when the house is cleanly, the ventilation good, and the drainage properly attended to.

It is somewhat difficult to say in what consists the disinfecting power of plentiful supplies of fresh air. General cleanliness often goes along with good ventilation, but there are many instances of immunity from consumption, even where the surroundings are of the most filthy description. It is well known that the islanders of St. Kilda, and of many of the Western Hebrides, are almost free from the disease, and yet their well-aerated hovels are filthy in the extreme, the manure of the animals that are allowed free entrance being allowed to collect upon the floors until sufficient quantity is collected to be carted away into the fields, and similar conditions prevail in many other places where phthisis is yet very uncommon, as in the homes of the Tartars of the Steppes, and the tents of the nomad tribes of Arabs, gypsies, &c. It is for this reason that I have ventured to suggest that where consumption is prevalent there must exist some special nutriment in the air which either (1) serves to prolong the life of the bacillus of tubercle, or (2) which may even increase its virulent properties, this special element in foul air being either the organic matter exhaled from human bodies, or the emanations from polluted ground air from badly drained subsoils. I should imagine that either of these hypotheses might account for the result, and certainly in the few experiments which I have carried out to find the conditions that modify the virulence of the bacillus, it was proved that foul air caused the organism to retain its power for evil much longer than when it was exposed to pure fresh air and light.

Viewed in relation to the prevention of phthisis, however, the subject of ventilation, or rather the purification of the respired air, is a very large one. It involves not only the mechanical problem of admitting to living rooms a sufficient number of cubic feet of the outer air, but it includes the removal of what has been aptly termed the air sewage, from that air, and from the air of all places where human beings congregate. In the streets of towns there must be free course given to the winds of heaven; there must be no blind alleys or streets closed up at one end (in the investigation into the phthisis distribution in Manchester and Salford which I have already mentioned, these conditions proved to be a powerful factor in determining the increase of the disease). Accordingly, whilst it is very important that houses should be made healthily habitable by securing thorough ventilation, that back-

to-back houses and undrained and un-aerated basements should be utterly abolished; in other words, that the cave-dwellers of modern times should be provided with decent and healthy tenements; whilst workshops and factories should be properly ventilated and freed from dust; whilst schools and places of public assembly should be more efficiently supplied with a sufficient flow of air in proportion to their temporary inmates; whilst all this is being attended to, more thoroughly than it is at present, greater attention must also be paid to the laying out of the streets, and to the condition of the outer air.

To satisfy those requirements the local authorities of most of our large towns will have to undertake extensive works of sanitary re-construction, and will have to put in force the strongest powers that they now possess for the prevention of pollution of the atmosphere by smoke and noxious vapours; and they must provide ample lung space in the shape of public parks and open playgrounds. There can be no doubt that in order to carry out these views and to lower the fearful death-rates from diseases of the respiratory organs and from infantile diarrhœa that now prevail in certain well-known unhealthy areas in such towns as Manchester, and Salford, and Preston, it will be necessary to entirely reconstruct portions of those towns.

It is possible that these may be regarded as somewhat strong proposals, but at least they have the merit that they may all be put in force without any material increase in the powers now possessed by local authorities. The only thing needed to enable them to be carried out in their entirety, is a powerful public opinion to back them up. When people generally, and especially the working classes, realize that a large part of their sickness and consequent loss of time and money is due to neglect, they will unquestionably be on our side. The undertaking possesses, moreover, the further merit that not only will all this sanitary improvement prevent consumption and other tubercular diseases by doing away with the sources of infection, but it will also prevent them by raising the general standard of health amongst town dwellers. It will so strengthen those who are already predisposed to the disease that they will more readily throw off any stray germs of tubercle that may find an entrance into their bodies. It will conduce to spontaneous cure, will prevent recurrence of the disease, and will ward off attacks from those who are now healthy.

I am not so sanguine as to suppose that the work of preventing phthisis will all be accomplished in the course of a few years. As Mrs. Browning says:—

> "The world we're come to late, is swollen hard with
> perished generations and their sins."

There still remain nearly 70,000 lives per annum to be rescued from this fell disease in England and Wales alone. I conclude by asking, in the words of the same poet:—

> "Who, being man, can stand calmly by,
> And view these things, and not tease his soul
> For some great cure."

The Influence of Soil on the Spread of Tuberculous Diseases.

BY

Professor FINKELNBURG, Bonn.

The author exhibited and explained a map illustrating the geographical distribution of phthisis-mortality in Germany, based upon a statistical research which embraces the period from 1877–1886. It appears from these researches that density of population in Germany has not the same effect upon the frequency of phthisis as in England, and that elevation of soil is of little or no influence at all. The districts most exempt from phthisis are those bordering the seas, particularly the eastern districts adjoining the Baltic. Industrial occupations, and especially all kinds of tissue-manufacturing, were regularly found coincident with an increase of the disease, but considerably more so amongst the male than the female part of population. The most striking feature of the map exhibited is the excessively high phthisis-mortality in some north-western districts inhabited by a merely agricultural population and distinguished by scantiness rather than density of population. The districts so strikingly affected have one peculiarity in common, *a mossy soil with stagnant and high-standing ground-water.* By comparing the natural condition of soil-humidity in the rest of Germany, a number of districts showed a similar coincidence of comparatively high phthisis-mortality with high and stagnating ground-water in the Rhenish Province, in Upper Bavaria, and in some partf of Silesia. This result forcibly recalling the well-known but lately much-combated observations of Bowditch and Buchanan concerning the influence of soil-humidity on the frequency of phthisis, it appeared necessary to investigate, if possible by experimental researches, in order to determine whether the condition of soil is actually so indifferent for the diffusion of tuberculous infection as many of our prominent bacteriologists seem to assume. Their chief objection being that the temperature of soil was too low to allow any growth or even any sporulation of tubercle-bacilli on or in it, the author's first inquiry was directed to ascertaining the temperatures in the uppermost layer of the soil. This inquiry gave a result which showed that the above assertion was erroneous for the hot part of the year, and that the effect of solar *radiation* had not been sufficiently taken in consideration.

The observations grouped together in this table show a temperature sufficiently high for sporulation and partly even for germination and growth of bacilli, during six hours of the day, in the uppermost stratum of the soil. Although this observation only applies to midsummer for our latitude, it is of sufficient importance to demand further comparative observations and it seems to indicate, so far as temperature is concerned, a great fitness of soil in southern climates during the greater part of the year for the development of tubercle germs sown on the surface of the earth.

I.

TEMPERATURE (Cels.) of AIR and of SOIL from the 22nd day of JULY to the 22nd day of AUGUST 1890.

For	In the Air.	On the free Upper surface of Soil.	At 3 Millm. deep.
8 Hours.	17·1	16·9	16·3
9 "	19·3	23·8	23·1
10 "	20 5	28·9	28·0
11 "	21·6	34·4	33·2
12 "	22·4	38·9	37·1
1 "	23·9	40·3	39·8
2 "	25·0	43·1	42·0
3 "	24·0	43·0	41 9
4 "	22·1	39·8	40·1
5 "	19·6	35·9	36·2
6 "	19·2	26·4	28·8
7 "	18·3	20·2	20·6

A second question to be answered, one of great practical interest independently of the foregoing inquiry, concerns the comparative fitness of soil to *retain tubercle infection* in its uppermost stratum for a shorter or longer space of time. Experiments intended to answer this question were frustrated at first by the deadly poisonous effect which the *bacillus œdematis maligni* exercised on the experimental animals. Not being able to find any natural soil free from the last-named bacilli, different kinds of soil were sterilised thoroughly before sowing tuberculous matter upon their surface, and observations were then made under various conditions of humidity resembling those occurring in nature.

II.

INOCULATIONS of TUBERCLE-INFECTED SOIL in PORPOISES produced TUBERCULOUS DISEASE :—

——	Marshy soil.	Clay soil.	Sand.	Gravel.
With permeable subsoil	After 75 Days.	After 60 Days.	After 30 Days.	After 15 Days.
With impermeable subsoil and a ground-water level of 2 centim. below the soil-surface - -	90 Days.	90 Days.	60 Days.	15 Days.

The results of these investigations are not of any conclusive value as to the part played by soil in the propagation of tuberculous diseases, but they seem of sufficient importance to invite further investigations to be made under various conditions. The author adds, in conclusion, that he does not recognize an absolute solidarity of the question of soil-influence with the bacteriological question. There can be no doubt that

the frequency of phthisis in a population is dependent upon some other influences, producing personal susceptibility or immunity, besides the greater or lesser multitude of tubercule germs surrounding us. If further investigations should teach that habitation on a moist soil with stagnant ground-water makes people more susceptible to tuberculous infection, a similar conclusion would apply to mankind as is acknowledged in the case of trees badly affected by parasites in consequence of their growing in a too moist subsoil. The forester does not waste his time in scratching off the parasites, but he drains the soil, and the trees recover. The comparison is certainly a very conditional one, but there may be some analogy; and if there is, it will be worth while to elucidate the question more thoroughly by further observations.

To what extent can Legislation assist in diminishing the Prevalence of Consumption and other Tuberculous Diseases?

BY

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Physician to the North London Consumption Hospital.

This title opens out a wide field for consideration, but in the short time at disposal it will only be possible to indicate the main points at which preventive legislation may be applied.

Some continental nations, Italy for example, have for years included in their Sanitary Codes certain regulations specially directed against consumption, a chief provision of which deals with the disinfection of rooms in which phthisical patients have died. Such regulations founded only on an uncertain belief of the infectiousness of consumption, and not being based on a scientific knowledge of the nature of the tubercular condition, are but crude efforts, and cannot be taken as the basis of preventive legislation. It would be difficult to show that they have had any appreciable effect on the prevalence of consumption in those countries where they have been in force, nor have they resulted in any special immunity of such countries from tuberculous diseases.

With the more exact knowledge of the nature of consumption and other manifestations of the tubercular process, which resulted from the discovery of the *bacillus tuberculosis* ten years ago, and with the experimental proofs of the transmission of tubercle by inoculation, and through the ingestion of tuberculous flesh or milk, as well as by the respiration of infected air, we have now some scientific basis on which to construct preventive measures; but beyond this knowledge of the active agent of tuberculosis, and of modes by which it may gain entrance into the body, we recognise certain conditions of lowered vitality, or the like—either of the individual or of certain organs and tissues—without which exposure to the infective agent may lead to no

ill effects, but which, when present, produce in the person a susceptibility or predisposition to receive the infection and develope tubercle. Thus, although we may acknowledge that infection—the inception of the specific micro-organism—is the necessary and essential factor for the development of tubercle in the individual, we recognise that the power for harm of the infective material is so largely influenced by the health of the person exposed to its attack that the predisposing causes assume almost greater importance, from the point of view of preventive measures, than does the mode of infection.

Yet the virulence of the infection may be so increased by concentration of the poison that a robust constitution may be unable to withstand it; and, therefore, whilst we endeavour to remove the conditions which tend to produce a lowered vitality in a community, or a damaged state of special organs rendering them more susceptible to infection, we cannot neglect precautions directed against the concentration of infection; and something may be done to prevent the wide-spread dissemination of infection, whether from consumptive persons or tuberculous animals.

In a former paper on the prevention of phthisis * I endeavoured to point out the various ways in which the infection of tubercle might gain entrance into the body, but for our present purpose we may confine our attention to two chief causes of infection, viz., infected air and infected food. Both these direct causes of tubercular infection are to some extent controllable, and we will discuss them before turning to the consideration of the control which may be exercised upon the conditions which predispose communities or individuals to suffer from these causes.

Although it is probable that air tainted by the emanations from phthisical patients is the commonest infecting cause, it would be of little value to suggest enactments on the same lines as those directed against the acute infectious fevers. This disease is infectious, as far as we know to the contrary, throughout the whole of its often prolonged course, and, if isolation of the consumptive patient were attempted, either we should make his position as bad as that of the leper of old, or more probably we should not have his condition notified until death seemed imminent. The difficulty of recognising with certainty the early stages of pulmonary tubercle would form a ready excuse for neglect of notification until the patient had been poisoning the air for many weeks or months.

And yet there might be great advantage in requiring that a case of tubercle should, under certain conditions, be notified to the health officer. The danger of all infection increases with the close crowding together of sick and healthy, and with deficient ventilation. Thus, the dangers are greatest in tenement houses, single-room dwellings, or common lodging-houses. All these being, for many reasons well known to the sanitarian, possible dangers to a community, should be under

* Transactions of the Epidemiological Society of London. N.S., Vol. VIII., 1889.

inspection and control. To existing regulations for such places it might be well to add provision for the notification of illness which keeps the patient confined to bed or incapacitated from work beyond a certain time (say one, two, or more weeks), requiring in this, as in other cases, medical evidence as to the nature of the disease. When the illness is tubercular phthisis, it might be advisable to effect the removal of the patient, where the sick-room serves also as the living room of several susceptible persons; or in any case to direct the disinfection of sputa, attention to free ventilation, and the efficient fumigation of the room after removal or death of the patient. Similar precautions might be necessary in hotels and lodging houses, especially at health resorts. The removal of phthisical patients would necessitate provision for their reception, and the present hospital accommodation is obviously insufficient for the purpose. Nor are the existing consumption hospitals intended for the reception of phthisical invalids in an advanced condition of the disease. These hospitals are mainly provided in the hope of curing or checking the disease, and so enabling the patients to resume their places amongst the workers. Homes for incurable consumptives are few, and not always utilised for their intended purpose. A sanitary district should provide a home for its own advanced consumptives, where the sufferers should be received without thereby incurring the brand of pauperism; these invalids would thus be prevented from being unwilling dangers to others. In such homes, as in consumption hospitals, disinfection of all sputa should be strictly attended to.

When we come to the possible dissemination of tubercle through infected food, it becomes extremely difficult to suggest a limit for preventive legislation. If all cattle or other animals which are tuberculous in any degree are liable to seizure and destruction, much loss may be incurred; and the loss must fall on the community or on the individual owner. It can hardly be proposed to compensate owners for all animals so destroyed. Even partial compensation would entail severe loss on owners, as well as great expense to the nation. If in any case we can contemplate a compensation for such animals, it would be in the case of owners who gave early notice of any suspected animal; it might then serve as an incentive to care.

No compensation should be allowed where a tuberculous animal had been slaughtered for food or the flesh exposed for sale.

But the chief aim of legislation should be the prevention of tuberculosis in cattle, rather than the destruction of tuberculous flesh or milk. More attention to cubic space and ventilation in the sheds, and the early isolation of suspected animals, would probably produce far more important results than the most rigid inspection of meat and milk. Here also inspection of the sanitary circumstances of the animals by competent men is essential, for monetary considerations outweigh regard for the public health with the majority of private persons. This necessitates public expenditure, but the public contributions cannot be better expended than in preserving the public health. Tuberculosis

should no longer be kept out of the list of diseases of animals which must be notified (as in the Contagious Diseases (Animals) Act).

We are still unable to control the possible *importation* of tuberculous food, for unless tubercular nodules are found in the flesh the meat cannot be seized, and there is no ready means of knowing that the animal was free from tubercle in the absence of the viscera and membranes. If cattle kept for food were subject to frequent inspection, and if suspected animals were isolated, it would not be difficult to prevent the sale of tuberculous milk, or at least to prevent its being sold until it had been boiled. The milk from tuberculous cows should not be used, even as food for pigs, until boiling had rendered it harmless. Tuberculosis is said to be more common in cattle destined for food than in the general bovine population,* and we may surely refer this to the conditions under which the cattle for food are kept.

But the most promising field for preventive legislation is to be found in endeavouring to combat the predisposing causes of tuberculous diseases in a community. We have abundant evidence of the influence of overcrowding, of dampness of the subsoil, and of dusty occupations in determining the incidence of tubercular diseases.

In large towns we have a general overcrowding of the population on a confined area, and in special parts of such towns there is a more localised and intense overcrowding of the poorer inhabitants. Consumption and other tuberculous diseases are more frequent in large towns than in more sparsely populated localities, and in the towns it is the densely inhabited, poorer districts, which suffer most. The general overcrowding incident to all towns may be regulated and kept within the requirements of health by enactments regulating the width of streets, the height of houses, and the provision for open spaces, such as are to be found in the model byelaws of the Local Government Board. But such enactments should be universally enforced by general legislation, and not be dependent for their adoption on the wisdom or fancies of local bodies, whose anxiety for the public weal is often modified by more personal considerations of commercial expediency. But, however well the construction and surroundings of the houses may have been planned, they may be rendered unhealthy by the overcrowding of the inmates. Sufficient air-space for the inhabitants is more likely to be found in the houses of the well to-do than in the dwellings of those to whom the question of rent is of more pressing importance than the sanitary condition of the rooms.

When several members of a family work at home, the air of the rooms never gets properly changed, and all the evil effects of overcrowding become aggravated.

Where a house is occupied by more than one family, and the owner has a pecuniary interest in packing as many individuals into the house as it can contain, inspection is required in the interests of the lodgers.

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* Influence of heredity and contagion in the propagation of tuberculosis. Fleming. London.

Thus, tenement houses should be licensed to contain a certain maximum number of inmates only, and similar provisions might with advantage be made for ordinary houses let in lodgings, and, perhaps, also for hotels and flats. Such regulations would entail inspection of such houses to prevent infringement of the law. The Local Government Board already has the power to enforce some such regulations in the case of sub-let houses; why should there be any longer delay in taking advantage of it? These regulations also should be general and not merely permissive. Common lodging-houses are already under regulations.

Where a trade is carried on in the house, inspection within business hours should be provided, and no trade should be permitted to be carried on in any single-room tenement occupied by more than two persons, and then only if the room is above a certain size. To provide for the workers thus prevented from pursuing their occupation at home, public workrooms could be provided, where space and facilities for the various occupations (*e.g.*, tailoring, bootmaking, etc.), could be obtained for a nominal payment. Public wash-houses have diminished the periodical using of the dwelling-room as a laundry and drying-room. Certain trades might be scheduled (as dangerous or offensive), and these should on no account be permitted in rooms used as sleeping rooms. Again, to be effective, any such regulations must be universal throughout the kingdom, at least in the towns.

If nothing further were done than to apply throughout the country the byelaws and regulations which are now permissive, much benefit would result to the public health, and something would be done to diminish the prevalence of tuberculous diseases. We might contemplate with less regret the present impossibility of dealing with hereditary tubercle, the marriage of tuberculous persons, and the suckling of infants by tuberculous mothers, if we could by such means as have been indicated diminish the risk of acquiring tuberculous diseases; for healthy parents cannot produce tuberculous offspring, and healthy children growing up under more favourable hygienic conditions have a lessened susceptibility to infection.

The physical training of children in the open air is already cared for in board schools, and is of vast importance. But healthy recreation for the parents, when the days' work is over, is not so easily obtained; and perhaps we must look to the efforts of philanthropists to provide inducements to the mother to leave her close room for an hour or two in the evening, and to keep the father from the public-house.

For those who work at dusty occupations protective measures have already done much, but even they would be less liable to consumption if the infectious particles were not ever-present, or if the sources of infection—their consumptive neighbours—were fewer in number.

The question of preventive legislation directed towards the diminution of tuberculous diseases is not one to be put aside because of its difficulties, though they are many and great. Where the national good is concerned means have always been found to grapple with and overcome even greater difficulties than present themselves here.

De la Phthisie pulmonaire au Hâvre (1880–1889).

PAR

le Dr. Gibert, Hâvre.

La mortalité générale de la ville du Hâvre est très élevée, car elle est de 30 décès pour mille habitants, et elle est rarement descendue au dessous de 30.

Deux facteurs contribuent à maintenir un chiffre aussi élevé. La phthisie pulmonaire et la diarrhée estivale des enfants en bas âge. La phthisie dont je viens vous entretenir prélève chaque année un tribut mortuaire de près de 600 vies humaines, ou pour la période de 1880–89 une proportion de 491 décès pour 112,000 habitants.

Ce chiffre demande à être étudié dans ses éléments et l'on verra par l'étude que je vais en faire, au nom du Bureau d'Hygiène du Hâvre et de son Directeur le Dr. Launay, que les causes de cette excessive mortalité pourraient être victorieusement combattues.

Je vais passer en revue successivement : la distribution géographique de la phthisie au Hâvre ; l'influence évidente de la densité de la population, et par conséquent de la contagion ; l'influence de l'âge ; l'influence de l'alcoolisme et de la misère ; et l'influence du climat maritime.

1°. *Distribution géographique de la phthisie et l'influence de la densité.*

La vieille ville resserée dans des rues étroites, mal aérées, un grand nombre sans soleil, dont les maisons ont jusqu'à 5–6 étages, renferme une population d'ouvriers, de matelots, et d'un chiffre encore élevé de population flottante appartenant à une classe sociale infime. C'est le quartier Saint François qui forme une véritable île comprise entre trois bassins—à coté de Saint François le quartier Nôtre Dame, allant de Saint François à la rue de Paris ; ces deux quartiers ont une population très dense allant de 522 habitants pour hectare à 233. La mortalité par phthisie de Saint François est de 7·95 ; et celle de Nôtre Dame de 6·33.

La différence de mortalité entre ces deux quartiers qui se touchent me paraît s'expliquer par l'influence de l'alcoolisme comme nous le verrons plus loin.

Immédiatement après ces deux quartiers se place toute la partie de la vieille ville comprise entre le quartier Nôtre Dame et le Boulevard Francois 1er, même population, même densité, mais un peu plus d'aisance, et moins d'alcoolisme ; mortalité par phthisie 5·42.

De la vieille ville nous allons à Graville qui contient une population d'ouvriers employés aux usines et moins adonnée à l'alcoolisme.

Les trois quartiers de Graville ont une mortalité de 5·26, 4·90 et 4·67, soit une moyenne de 4·94.

Le quartier de la côte présente une mortalité excessive de 5·12 mais ce chiffre pris en bloc serait absolument erroné si on ne montrait qu'il s'agit en réalité, non de la côte d'Ingouville, mais du quartier qui

s'étend de la rue d'Etretat au bas de la côte ou à mi côte et des quatre chemins. On trouve là une quantité de rues assez étroites, occupées par une population d'ouvriers, tandis que la côte elle même n'est occupée que par les négociants de la ville, vivant dans des villas isolées, et ne présente en réalité qu'une mortalité insignifiante par phthisie pulmonaire.

Vient ensuite le quartier de l'Eure avec une mortalité de 4·61. La population y est pauvre, mais il y a beaucoup plus d'espace qu'à Graville, et ce chiffre élevé ne peut s'expliquer que par la misère et l'alcoolisme.

Les deux quartiers situés entre la Graville et la nouvelle ville ont une mortalité de 442, et de 4·37 et le quartier du Peney de 4·44.

Enfin toute la nouvelle ville construite de puis 1860 autour de l'hôtel de ville, le long du Boulevard de Strasbourg jusqu'à la mer ne présente plus une mortalité que de 3·87, 3·25, 3·42 et 3, soit une moyenne de 3·38.

Il suffit donc d'un simple coup d'œil jeté sur la grande carte teintée que je vous présente et sur les petites cartes où les décès par quartiers sont marqués par des points noirs, pour comprendre l'énorme différence qui existe dans la distribution de la mortalité par phthisie. Cette différence peut aller du triple au simple, et cela suffit pour prouver qu'il serait possible d'agir efficacement pour la combattre par des mesures générales dont je parlerai dans mes conclusions.

La mortalité par quartiers comporte un enseignement très remarquable puisqu'il permet de constater l'influence de la densité de la population. Cet enseignement est plus net encore quand on considère la mortalité par rues.

Le bureau d'hygiène a fait faire un relevé général des décès par phthisie classés par rues pour la période de dix ans de 1880 à 1889. Ce travail considérable, trop volumineux pour que le joigne à ma communication me fournit les exemples suivants :—

La mortalité par quartier nous présentait des différences du simple au triple. La mortalité par rues nous présente des écarts bien plus considérables :

Les rues.	Pour 10,000 h.	Les rues.	Pour 10,000 h.
Frère constante donnant -	142	Joinville - - -	13
Traversière - - -	146	Fulton - - -	13
Petit Croissant - -	122	Givudy - - -	14
Sully - - -	122	Flechier- - -	11·77
Fontenoy - - -	120	Atlas - - -	21
Des malières - -	120	Bard - - -	13
Petit Portuii - -	93	Escarpée - - -	17
Dauphine - - -	93	Just Viel - -	21
Duguay Tronin - -	93	Paul Lucas - - -	24
Etoupières - - -	89	St. Victor - -	27
Rotton - - -	13		

C'est à dire qu'il y a une différence qui peut aller de 12 à 1 entre une rue et une autre, et pour les rues où la population appartient à la

même elasse sociale, ou les habitudes sont les mêmes, les logemeuts également semblables, par exemple la rue Traversière et la rue Paul Lucas la différence peut être eneore de 6 à 1.

Ainsi il ressort de l'examen du relevé fourni par le Bureau d'Hygiène que tout dans la mortalité par la phthisie ne s'explique pas par la densité de la population ni par l'état social des habitants. Le facteur qui paraît avoir une importante évidente et qu'uu travail statistique plus circonstanciel pourra mettre en relief c'est l'influence de la lumière dont la suppression paraît au Dr. Launay être une des causes de la mortalité excessive par phthisie dans les rues qui occupent la première colonne.

D'après M. Launay dans les rues frappées d'un nombre excessif de décès phthisiques le eôté de l'ombre est toujours plus frappé.

Cette observation n'est pas, bien entendu, spéciale à la ville du Hâvre, mais e'est la première fois je le crois au moins, que cette démonstration a été faite dans une grande ville.

Influence de l'alcoolisme et de l'âge.

La ville du Hâvre est malheureusement uue des villes où la consommation de l'alcool atteint un chiffre très élevé.

Le chiffre de consommation de l'alcool donué par l'octroi est de 18 litres par an et par habitant, à 90° ; ce qui représentc une eonsommation de 30 litres par an et par habitant, puisque dans les débits le litre des boissons offertes aux clients varie entre 40 et 50 °/₀.

Ce chiffre énorme n'est pas également réparti, et c'est justemeut dans le quartier de la vieille ville, Saint François et Nôtre Dame qu'il se vend le plus de spiritueux, là où, comme nous l'avons vu, la phthisie sévit avec le plus d'intensité.

Les rues les plus frappées, la rue Royale, la rue d'Albanie, la rue Dauphine, ont aussi un nombre de *débits* le plus élevé, soit 37 pour la rue Royale (1 débit pour 31 habitants), 18 pour la rue d'Albauie (soit 1 débit pour 53 habitants), 25 débits pour la rue Dauphiue (soit 1 débit pour 50 habitants).

Sans continuer cette nomenclature assez fastidieuse, on peut dire que le nombre des débits et la mortalité par phthisie ont une marche parallèle.

L'influence de l'âge prouve d'une manière péremptoire que l'alcoolisme est la cause la plus active de phthisie au Hâvre. Il résulte d'une étude faite antérieurement par moi que sur 484 décès de phthisiques :

80	ont lieu de	1 an	à	20 ans.
341	„	20	„	50 „
63	„	50	„	10 „

Si la phthisie était essentiellement héréditaire, si le facteur de l'hérédité, comme on l'a crû si longtemps jouait le plus grand rôle, le nombre le plus grand des décès aurait lieu de 0 à 20 ans, mais au contraire, 18 pour 100 des phthisiques qui meureut au Hâvre, meurent avant 20 ans; 70 pour 100 meurent entre 20 et 50 ans; et 12 pour 100 meurent entre 50 et 80 ans.

C'est dans la force de l'âge, à l'époque où la cause héréditaire, si elle existe, est certainement épuisée, que la phthisie frappe la population havraise, et une pratique de tous les jours enseigné aux medecins que le plus grand nombre de leurs malades phthisiques sont des alcoolisés.

Je ne veux pas dire qu'il existe une phthisie alcoolique, je dis, que l'alcool est un des facteurs qui prépare le plus surement le terrain de la tuberculose.

Influence de la Contagion.

La contagion résulte pour nous de la démonstration que nous avons faite de l'influence de la densité. Partout où les maisons à étages et à multiples logements existent, la phthisie fait de grands ravages. Je ne veux pas, ici, faire dire à mes tableaux statistiques plus qu'ils ne disent, mais il m'est permis de montrer pas la simple inspection des cartes que je vous présente que la contagion est le facteur évident de la mortalité par phthisie.

L'étude que le regrettable Docteur Leudet de Rouen avait faite de famille en famille dans sa clientèle a d'ailleurs depuis longtemps fait la lumière sur cette partie importante du problême de la phthisie.

L'Influence du Climat maritime

me paraît être nulle. Toute la ville du Hâvre est surmise à l'action de l'air marin, mais on peut voir par l'inspection de la carte que les parties de la ville ne sont pas épargnées par le voisinage immédiat de la mer, et pas davantage plus frappées.

Le quartier du Perrey dont le sous sol est lavé deux fois en 24 heures par l'eau de mer, aux deux marées, présente une mortalité élevée. Un peu plus loin, toujours sur le littoral, se trouve un quartier tout autant exposé à l'action de l'air de mer et qui présente une mortalité sensiblement moins élevée.

L'air marin guérit ou modifie puissamment la scrofule. Il ne me paraît pas avoir d'action ni en bien ni mal sur le développement de la tuberculose pulmonaire.

Influence de la misère

nous paraît évidente. C'est l'étude de la phthisie par rues qui nous en fourmit la preuve. Il y a des rues qui sont decimées pas la phthisie, ce sont celles comme la rue Traversière, des Boucheries, du Petit Portail, où s'entasse dans des logements misérables une population qui fait le fond des clients de l'assistance publique. Certaines maisons sont frappées comme par une meladie aiguc, et ce sont celles où la population est privée ausi bien d'aliments que de vêtements.

Conclusions.

La phthisie pulmonaire au Hâvre représente le sixième des décès.

Elle n'est pas une conséquence du climat.

Elle frappe la population d'une façon très inégale.

La vieille ville avec les rues étroites, sans air, sans lumière, à population ouvrière très dense, est frappée trois fois plus que d'autres parties de la ville.

L'alcoolisme me paraît exercer une action prépondérante sur le développement de la phthisie chez l'adulte. S'il n'est pas une cause directe, il est de toutes les causes prédisposantes, la plus active, la plus meurtrière.

L'héredité, n'exerce pas au Hâvre une action évidente, puisque de 0 à 20 ans il ne meurt que 18 pour cent des phthisiques.

Pour faire disparaître la phthisie du Hâvre il faudrait transformer la vieille ville par la création de larges voies ouvertes à l'air et au soleil.

Combattre le fléau de l'alcoolisme en supprimant la liberté des débits, en provoquant la création de sociétés et de cafés de témperance, en disant aux ouvriers dès l'école primaire tous les dangers des boissons alcooliques.

Et enfin créer des habitations ouvrières, saines, spacieuses, aérées.

La phthisie est un fléau social qui peut disparaître partout où il sera combattu avec énergie par des moyens appropriés.

DISCUSSION.

Sir John Banks, K.C.B. (Dublin), said that he could not abstain from making a very short observation on the subject to which such admirable papers had been contributed. He desired to make special reference to that of Dr. Ransome. With his views as to the preventability and curability of tubercular disease he thoroughly agreed. As to the preventability of the disease, he might observe that he had marked a diminution of the disease in Dublin, which he attributed to the improvement in the dwellings of the poor, and the supply of pure water. He had had, in private and hospital experience, ample proof of its curability.

The Progress of Mortality from Tuberculosis, Typhoid, Diphtheria, Small-Pox, Scarlatina, and Measles in Florence during the Twenty-five Years from 1866 to 1890.

BY

Dr. Leonida Castelli, Florence.

The second half of the present century has been distinguished for the progress made in the sanitary amelioration of the principal cities of Europe for the prevention of infectious disease. Florence affords a striking instance of the improvement which has thus taken place, and the following is a brief sketch of the results which have been attained in that city.

Typhoid fever, which is endemic in all great centres of population, is the disease which shows most clearly the efficiency of hygienic works; and its frequency has been taken as a measure of the value of works executed for promoting public health. On this account, Pettenkofer in Munich, and Di Mattei in Catania, have studied the progress of typhoid in these towns. In order that the study of the sanitation of Florence should be more complete, the present paper includes tuberculosis, diphtheria, scarlet fever, measles, and small-pox; and the period of observation has been extended to twenty-five years—from 1866 to 1890.

In sanitary statistics the medical man must have regard to the precepts of pathology. For instance, under the term typhoid fever has been included gastric fever, miliary fever, etc.; whilst cases of gastro-enteritis during dentition and of cerebral typhoid have been excluded. Similarly, under diphtheria are included cases of diphtheritic croup.

The original diagrams show the deaths for each of the above diseases for every month in each year, but inasmuch as the limits of this publication would not admit of the complete diagrams, the deaths in each year alone are shown in the diagram here printed. (*See* page 184.)

Under each year is shown the population of Florence, except between 1870 and 1880, during which period the capital was being transferred from Florence to Rome, and consequently a great diminution of population was taking place.

Monthly Mortality.

The monthly average number of deaths from typhoid, tuberculosis, and diphtheria is shewn in the following table.

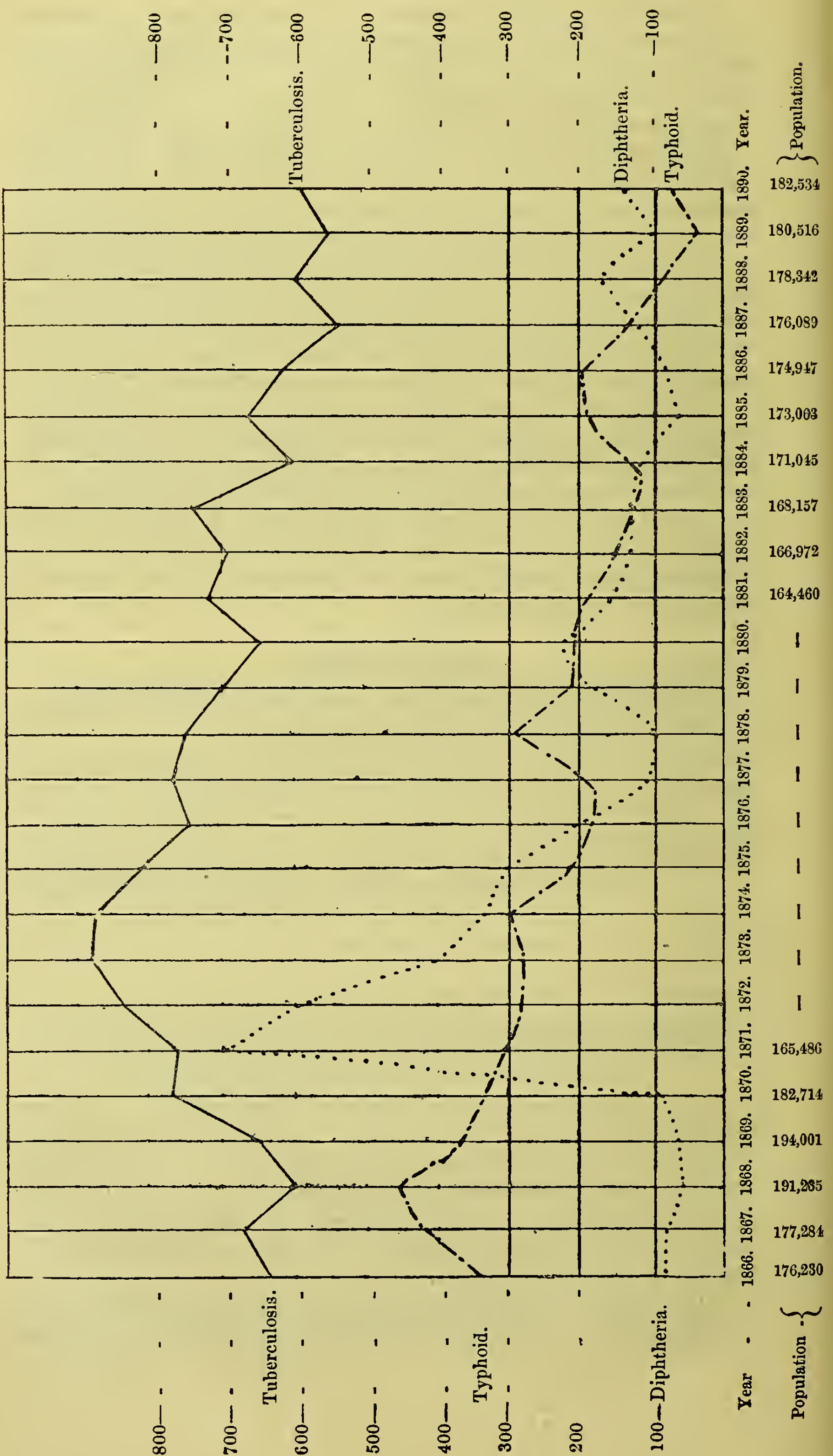
Mean Number of Deaths in 25 Years.

From	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Typhoid - -	15·4	14·4	17·0	16·7	19·6	18·5	25·9	23·1	24·0	23·6	20·2	20·9
Tuberculosis -	55·3	53·3	64·6	65·2	61·3	58·8	59·0	58·0	57·3	57·6	55·9	53·0
Diphtheria - -	16·0	17·1	17·4	14·8	11·7	13·2	14·2	13·5	11·5	16·6	16·8	17·3

The deaths from typhoid are subject to great variation. It may be mentioned that only two deaths occurred in November, 1889, whilst 61 deaths occurred in July, 1868. Usually in the first half of the year typhoid is equally distributed over the months, the minimum number of deaths being generally attained in February. In the second half of the year the numbers increase rapidly, the maximum being generally attained in July and September.

In the case of tuberculosis the mortality shows slight monthly variations, with a small increase in March, April, and May. In the

DIAGRAM showing the Annual Number of Deaths in the 25 years 1866–1890, in Florence, from Tuberculosis, Typhoid, and Diphtheria.



whole series of years the minimum monthly number of deaths was 23 in August, 1880, and the maximum was 93 in March, 1874.

With diphtheria, on the other hand, there were great monthly variations, which are not shewn in the average. For instance, while there were no deaths in September and November 1889, there were 109 deaths in October 1871. The above table shows that diphtheria increases on an average in the three last and in the three first months in the year.

The report of the State Board of Health of Massachusets shows that similar results in the case of these three diseases prevailed there, and the records of Denmark shew similar statistics.

Dr. Buchan and Dr. Mitchell, of New York, observe that small-pox attains a maximum mortality in May and a minimum in September; that measles attains a maximum in July and September, and a minimum in February and April; and that scarlatina attains a maximum in April, and a minimum in September. In Florence nothing of the sort is observed. On the contrary, the month which gives a maximum one year often gives a minimum in the following year. If anything, these diseases appear to prevail when the schools are open.

The following table shows the deaths from these diseases in each month for the two quinquennia—1866 to 1870, and 1886 to 1890.

DEATHS from SCARLATINA, SMALL-POX, and MEASLES in the Two Quinquennial Periods, 1866–70, 1886–90.

DISEASE.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	YEAR.
Scarlatina	–	1	1	–	–	–	–	1	–	–	–	3	1866
	2	2	1	–	2	–	1	1	2	1	1	1	1867
	–	1	1	2	1	–	3	2	–	–	–	3	1868
	–	1	–	1	–	–	1	1	2	2	–	3	1869
	1	–	1	–	3	1	1	–	–	2	3	3	1870
Small-pox	3	4	2	2	3	–	1	1	1	2	–	2	1866
	6	6	13	13	6	10	14	14	16	18	22	11	1867
	7	2	2	2	1	1	1	–	–	–	–	–	1868
	–	–	–	–	1	1	–	–	4	–	1	–	1869
	1	–	1	–	1	5	1	1	–	3	7	5	1870
Measles	1	1	2	2	–	–	1	2	1	4	3	6	1866
	16	11	16	16	12	10	3	4	2	–	–	1	1867
	–	–	–	3	3	1	–	2	1	–	–	–	1868
	1	1	–	–	1	1	2	3	4	2	5	2	1869
	2	–	1	3	5	1	3	4	2	–	1	2	1870

Disease.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
Scarlatina	–	–	–	–	–	–	–	–	–	1	2	4	1886
	3	3	3	5	8	4	7	7	11	4	1	3	1887
	1	1	–	1	–	–	–	–	–	–	1	–	1888
	1	–	–	–	–	–	1	–	1	–	–	–	1889
	–	–	–	–	–	1	–	–	1	–	3	1	1890
Small-pox	–	–	–	–	–	–	1	–	2	5	1	1	1886
	2	4	9	11	13	20	27	35	59	58	33	14	1887
	7	4	7	4	1	1	1	1	4	1	–	3	1888
	3	1	–	–	1	–	–	–	–	–	–	–	1889
	–	1	1	–	–	–	–	–	–	–	–	–	1889
Measles	4	2	2	1	1	1	1	1	1	4	5	8	1886
	14	16	13	13	5	2	3	–	–	–	4	2	1887
	2	–	3	2	2	–	3	–	2	–	–	4	1888
	4	1	6	8	10	4	6	3	–	–	–	–	1889
	2	–	1	–	1	1	–	2	–	1	1	2	1890

Annual Mortality.

Typhoid mortality, which was high in 1866, increased in the succeeding years, probably in consequence of the agglomeration of population owing to bringing the capital to Florence. It attained a maximum in 1867-68, and remained high till 1880. From that period till 1890 the annual deaths did not exceed 200. The diagram shows that typhoid has been subject to periodical variations extending over about 10 years. The annual deaths increase with rapidity, and then diminish slowly. The first decennial period was from 1867 to 1877. The second from 1877–1887. The maximum was attained in 1868 and 1878.

Similarly, in the case of diphtheria, there was a low mortality till an epidemic occurred in 1871; it thence remained high till 1885, after which years the deaths diminished to under 200. In fact, these records seem to show that typhoid and diphtheria are subject to periodical outbreaks, which attain their maximum rapidly and then slowly diminish.

The mortality from tuberculosis is always high, and presents only slight changes. It is, however, noteworthy that the mortality increased from 1872 to 1875, and has diminished progressively since 1885. The increase from 1872 to 1875 would seem to have reference

to the mortality from typhoid and diphtheria in previous years, a conclusion which does not appear to be strained when it is recollected that various diseases seem to prepare the soil for the germs of other diseases.

Scarlatina, small-pox, and measles present very different results. The mortality is very much smaller than that from the three above mentioned. They do not appear to be endemic. Sometimes small-pox and scarlatina are altogether absent (see 1883, 1886), and they increase and decrease with equal rapidity.

With measles there appear to be distinct periods of about three years' duration. The mortality ascends and descends rapidly, and, unlike typhoid and diphtheria, their succession is independent of each other.

The mortality of all these diseases shows a decided diminution as it approaches 1890.

In the first ten years (1866–75) the mean annual number of deaths from tuberculosis was 749·7, from typhoid 335·6, and from diphtheria 271·8. In the last 10 years the mean annual mortality was—from tuberculosis 637·2, from typhoid 145·8, and from diphtheria 106·4. Hence, there have been saved in every year 467·7 lives from these three diseases. Similarly, the average annual deaths from scarlatina have diminished from 31·9 in the first decennial period to 19·3 in the second. With small-pox the deaths have diminished from 66·6 to 49·2; but measles increased from 28·7 in the first decennial period to 41·5 in the second. While the deaths from those diseases which attack adults have been diminished, the mortality from those which attack children has been little, if at all, reduced. The explanation lies in the fact that the diseases of children and youths are spread by schools. In the scholastic year 1870–71 the inscribed scholars numbered 4,146, in the year 1880–81 they were 6,268, and in 1890–91 they amounted to 9,180.

The diseases which caused the greatest part of the mortality have diminished. The improvements in the sanitary condition of Florence are evident; and whilst the diseases have diminished, the population has increased from 164,460 in 1880 to 182,534 in 1890.

Sanitary Works Executed in Florence between 1866 *and* 1890.

The sanitary condition of the town began to improve with the removal of the old walls which surrounded the part of the city on the right bank of the Arno. Some old quarters were improved, and new ones were created; new market-places were built at S. Ambrogio S. Lorenzo, and S. Frediano to replace unhealthy houses; and the new quarters Savanarola, Piagentina, and S. Jacopino added 302,280 hectares to the area of the commune.

Soon after 1870 the course of the Arno in the city was restrained by quays to prevent it flooding the lower part of the town; and the rain-water was carried by two intercepting sewers to the Bisenzio, a long way below the city.

	1866.		1867.		1868.		1869.		1870.	
——	Population 176,230.	Deaths per 10,000.	Population 177,284.	Deaths per 10,000.	Population 191,235.	Deaths per 10,000.	Population 194 001.	Deaths per 10,000.	Population 182,714.	Deaths per 10,000.
Tuberculosis -	648	36·7	680	38·3	611	31·9	661	34·0	763	41·7
Diphtheria -	88	4·9	82	4·6	61	3·1	66	3·4	94	5·1
Typhoid - -	352	19·9	428	24·1	487	25·4	371	19·1	340	18·6
Scarlatina - -	6	0·34	14	0·78	13	0·6	9	0·46	15	0·8
Small-pox - -	21	1·1	149	8·4	16	0·8	6	0·30	22	1·2
Measles - -	23	1·3	75	4·2	10	0·5	22	1·1	24	1·3
			During these years Florence was the capital.							
Total Deaths	1,081	—	5,205	—	5,279	—	5,389	—	5,595	—

	1871.		1872.		1873.		1874.	
——	Population 165,486.	Deaths per 10,000.	Population 166,464.	Deaths per 10,000.	Population 167,167.	Deaths per 10,000.	Population 167,621.	Deaths per 10,000.
Tuberculosis -	763	46·1	828	49·7	880	52·6	875	52·2
Diphtheria -	699	42·2	613	36·8	380	22·7	335	19·3
Typhoid - -	304	18·3	282	16·9	280	16·7	297	17·7
Scarlatina - -	16	0·9	9	0·5	16	0·9	149	8·8
Small-pox - -	282	17·0	34	2·0	60	3·5	59	3·5
Measles - -	12	0·7	33	2·01	52	3·1	15	0·8
Total Deaths	6,294	380·9	5,877	353·0	6,122	366·2	6,124	365·2

	1875.		1876.		1877.		1878.	
——	Population 168,144.	Deaths per 10,000.	Population 168,468.	Deaths per 10,000.	Population 168,135.	Deaths per 10,000.	Population 167,203.	Deaths per 10,000.
Tuberculosis -	788	46·9	746	44·2	770	45·8	758	45·3
Diphtheria -	300	17·8	193	11·4	108	6·4	100	5·9
Typhoid - -	215	12·7	185	10·9	188	11·1	296	17·7
Scarlatina - -	64	3·7	9	0·5	11	0·6	13	0·5
Small-pox - -	17	1·01	77	4·5	103	6·1	41	2·4
Measles - -	21	1·2	114	6·7	22	1·3	48	2·8
Total Deaths	5,802	345·0	5,433	322·0	5,573	331·4	5,827	348·4

	1879.		1880.		1881.		1882.	
—	Population 166,494.	Deaths per 10,000.	Population 166,331.	Deaths per 10,000.	Population 164,460.	Deaths per 10,000.	Population 166,972.	Deaths per 10,000.
Tuberculosis -	712	42·7	658	39·5	720	43·7	696	41·6
Diphtheria -	189	11·3	222	13·3	158	9·6	143	8·5
Typhoid - -	207	12·4	202	12·1	187	11·4	148	8·8
Scarlatina - -	143	7·9	26	1·5	17	1·0	82	4·9
Small-pox - -	23	1·3	52	3·1	46	2·7	81	4·8
Measles - -	14	0·8	53	3·1	29	1·7	22	1·3
Total Deaths	5,517	331·3	5,662	344·77	4,728	287·6	5,161	309·0

	1883.		1884.		1885.		1886.	
—	Population 168,157.	Deaths per 10,000.	Population 171,045.	Deaths per 10,000.	Population 173,063.	Deaths per 10,000.	Population 174,947.	Deaths per 10,000.
Tuberculosis -	744	44·2	601	35·1	670	38·7	626	35·5
Diphtheria -	141	8·4	129	7·5	72	4·1	81	4·6
Typhoid - -	130	7·7	107	6·2	175	10·1	196	11·1
Scarlatina - -	11	0·6	2	0·1	2	0·1	7	0·4
Small-pox - -	24	1·4	3	0·1	2	0·1	10	0·5
Measles - -	79	4·7	51	2·9	60	3·4	31	1·7
Total Deaths	5,116	304·2	4,376	255·8	4,751	274·5	4,856	277·6

	1887.		1888.		1889.		1890.	
—	Population 176,089.	Deaths per 10,000.	Population 178,342.	Deaths per 10,000.	Population 180,516.	Deaths per 10,000.	Population 182,534.	Deaths per 10,000.
Tuberculosis -	552	31·3	600	33·6	566	31·3	597	32·7
Diphtheria -	131	7·4	97	5·4	42	2·3	70	3·8
Typhoid - -	116	6·6	173	9·7	100	5·5	126	6·9
Scarlatina - -	59	3·3	4	0·2	3	0·1	6	0·3
Small-pox - -	285	16·1	34	1·9	5	0·2	2	0·1
Measles - -	72	4·0	18	1·0	42	2·3	11	0·6
Total Deaths	5,116	290·5	4,770	267·5	4,462	247·1	4,804	263·1

From 1872 to 1883 the street drainage was largely extended by constructing 24,161 metres of large drains, both in the city and in the adjacent new quarters. A public slaughter-house was built, and a water supply provided for the houses, together with a daily gratuitous distribution of 5,600 c.m.'s for fountains, hospitals, schools, and street-watering. This was a truly hygienic work, as the wells are more or less polluted. Unfortunately an epidemic of typhoid broke out last winter, which was undoubtedly due to the pollution of the water-supply. This is supplied to the amount of 2,000 cubic metres per day by an ancient aqueduct which conveys water from the River Mugnone, naturally filtered by means of the gravel and sand under the bed of the river, and to the amount of 12,000 cubic metres by the water of the River Arno, filtered in the same way; the rest is supplied by wells. The pollution manifested itself in the water taken from the Mugnone, and as it had its own particular aqueduct its use was easily abolished, and thus the epidemic was reduced.

Anyway, the proof that the municipal water is preferable to that of any well is clearly shown by confronting the deaths caused by typhoid fever during the period of 1866–70, in which well-water was almost entirely used, with the period of 1886–90, when the use of the new water had become very extensive. The mean of the deaths from typhoid fever in the first five years was 2·1 per thousand, and in the second period of five years it was 0·9 per thousand.

The progress of sanitation is being continued by the demolition of houses in the centre of Florence, and the construction of a mortuary and of an infectious hospital.

Conclusion.

The condition of Florence, as compared with other cities, is as follows. Florence occupies 41 square kilometres, and has a population of 182,534, or a mean of 4,367 inhabitants per square kilometre. London has a population of 13,000 per square kilometre; but the following table affords a better comparison.

City.	No. of Inhabitants per 1,000 Square Metres of Area Built over.	Percentage of Area Occupied by Streets and Squares to Area Built over.	Percentage of Area Occupied by Public Gardens to Area Built over.
Florence	39	42	37
Milan	52	40	13
Turin	57	47	7
Rome	73	63	9
Naples	86	28	4
Venice	105	133 with lands	5
Genoa	131	57	7
Palermo	143	—	—
Edinburgh	28	38	42
Paris	41	—	—
Brussels	47	59	34
Vienna	65	46	59
Berlin	71	37	20

Thus Florence has plenty of room for its population, and favourable conditions as to its buildings and open spaces, as compared with other cities.

The general death-rate of Florence compared with that of other cities of Europe, is as follows:—

London - - -	20·3 per 1,000.
Christiana - - - -	21.1 ,,
Brussels - - - -	21·5 ,,
Berlin - - - - -	21·6 ,,
Paris - - - -	24·5 ,,
Vienna - - - - -	24·6 ,,
Munich - - - -	30·0 ,,
Buda Pesth - - - -	31·4 ,,
Moscow - - -	40·3 ,,

In Florence the death-rate, including persons in hospital from the outside, was 24·7 in 1889, and 26·3 in 1890. Excluding those from the outside communes, it was 21·1 in 1889, and 22·9 in 1890, and this latter is the proper figure to take.

It is thus clear that Florence takes a high rank as a healthy city, not only amongst the cities of Italy, but also when compared with the cities of other countries.

Thursday, 13th August 1891.

The Chair was occupied successively by
The President, Sir Joseph Fayrer, K.C.S.I., M.D., F.R.S.,
Professor Dr. Pacchiotti (Turin), and
Dr. Walter Dickson, R.N. (London).

The Relation of Alcoholism to Public Health, and the Methods to be adopted for its Prevention.

BY

Sir Dyce Duckworth, M.D., LL.D., F.R.C.P., Physician and Lecturer on Medicine, St. Bartholomew's Hospital, Hon. Physician to H.R.H. the Prince of Wales.

The subject which I have the honour to bring before this Section is one which must claim a foremost place for discussion in this great International Congress of Hygiene. All matters relating to the question of the employment of alcoholic drinks are, and must be, of the highest importance to those who are interested in the welfare and progress of humanity.

And, Sir, standing here to open a debate on this subject in this vast metropolis and Imperial centre before such an auditory, I need hardly say that I am fully impressed with the gravity and significance of my position.

The whole matter is not new to me, for it has engaged my study and thoughts for many years. I feel, however, that while many older and better authorities on it might well have occupied my place to-day, I may have been entrusted to prepare the way for this discussion because I have always taken a temperate, though an earnest, interest in all that relates to the subject. I am not here as the exponent of any particular party, or as an apologist for any particular line of practice in respect of the consumption of alcoholic drinks.

The opinions I may express are the outcome of my own observations, and the results of a long-continued endeavour to find what I term working principles. I know that much of what I shall say will not accord with the views of many of my hearers who have given careful study to the question.

But I know equally well that I am not here to please any party or anybody in particular, but simply to state what I believe to be true; and I therefore can only respectfully claim your attention and fair consideration of what I may venture to say.

It is, I think, very fitting that we come to a discussion of this matter at the British meeting of this Congress, for we stand, by universal consent, almost, if not quite, at the head of all nations given over to the abuse of alcoholic liquors. Whether this reproach be rightly or wrongly cast upon us may be fairly argued; but there can be no doubt of the general truthfulness of it, and it is well to acknowledge it. The great alcohol question, then, is a burning, albeit a vexed, one for the British Isles and many of our dependencies. Let our foreign visitors to this Congress be clear that we in this country fully recognize the gravity of the charge brought against us. There is reason to believe that both in France and Belgium a great increase of alcoholic intemperance has taken place within the last quarter of this century, chiefly in the large cities and manufacturing centres, due especially to spirit drinking.

Other countries have happier experiences; and a study of the immunity enjoyed by them helps to shed light in many respects on the causes of our miserable national pre-eminence in this matter.

The standpoint from which I am compelled to study all the phases of this question is that of a physician with experience of the influences and effects of all forms and degrees of alcoholic consumption, as witnessed, too, amongst all classes of society. Such an experience gained in London should count for something; but I have added to it by travel and observations in many parts of the world.

The temper and mode of thought proper to a practising physician are just those which, in my opinion, are best fitted to apply to a study of the influence of alcohol upon humanity.

He should approach all questions and problems without bias, and calmly apply trained powers of observation to the study of the plain

facts of the case. His one aim is to gather facts accurately before propounding any theories. To this temper of mind is added a deep concern for the highest welfare and health of humanity, and an interest in all matters which affect its moral and material progress.

I do not affirm that all this is peculiar to those who exercise the medical art, but it may be safely conceded that no members of the body politic more fully live and act up to this standard. I therefore claim a very important place for the opinions of trained medical observers respecting the use and abuse of alcoholic liquors, though I am fully aware that serious differences exist even among such observers. The views I may set before you to-day will command, as I believe, the assent of a majority of the medical profession, and certainly of those who are unpledged to any definite principles, and practically unbiassed by any special theories.

I am far from considering the employment of alcohol as an unmixed evil in the world. I believe its use to be beneficial to humanity. We are here to-day to consider the misuse of it, the effects and results of such misuse, and to find the best methods for counteracting these. We acknowledge that all forms of intemperance are bad. Alcoholic misuse is only one variety of intemperance. We have many forms of intemperance to combat and deal with. The evils of perpetual excess in other things have to be reckoned with, and are fraught with peril to large classes of human society. We do not blink the fact that alcoholic excesses bring perhaps more misery and disaster in their train than most others. We can no more abolish alcohol, if we would, than we can abolish bread and butter, and have therefore to take its existence and use in certain populations into fair consideration.

The whole question resolves itself into one of general progress in civilization. We see no reason for despair or hopelessness, but we believe that progress will be made, slowly but surely, in the future as it has been slowly and surely made in the past. We take too little account of the good that has been certainly accomplished in the last half century. If we consider that populations are practically everywhere on the increase, and that means of locomotion and transport also steadily increase, we may find reason for grateful acknowledgment that misuse of alcohol does not likewise increase, but really diminishes. Nor must the fact of general increase in wealth be left out of this account. Greater numbers are annually exposed to luxury, and the temptations to intemperate and unnecessary drinking are unhappily daily multiplied, and, withal, we grow less, and not more, drunken.

It is not possible to regard the great mass of the populations of Northern Europe, which we may fairly consider inclusive of the best forces of civilization, as taking the lead in enterprise, literature, commerce, art, and the highest moral tone found in this world, as unaffected very materially by alcoholic habits. The nations thus uninfluenced must be allowed on all hands to be the inferiors. We must therefore submit that alcoholic use counts for something in all this; while we also confess that alcoholic misuse has been, and ever will be, an inhibiting factor in the progress of civilization.

If all that has been asserted respecting the harmful effects of alcoholic consumption were true, the finest races of men would ere now have been exterminated. The Hebrew race, for example, has always taken alcohol, and is one of the healthiest still existing in all parts of the world.

The fact of our national pre-eminence in drinking is, indeed, disputed by some. Sir William Roberts points out that there is a remarkable uniformity in the consumption of alcohol *per head per annum* of the population amongst the nations of Europe, and that, regarded in this way, the actual consumption is not excessive. A larger number of individuals, however, in this country take more than is consumed by our Continental neighbours.*

He also calls attention to the fact that certain inferior races appear to be intolerant of alcohol, which is either not adapted to their type of nutrition, or else they lack the self-control which is essential to its beneficial use.

The Japanese consume one-third as much alcohol per head as is taken in England in the form of beer.

A calm consideration of the whole question does not allow us of the medieal profession to affirm that the consumption of alcohol is an unmixed evil for civilized races.

As medical men we do not approach the question with any particular bias, and are not led by intimate familiarity with every form and variety of abuse of alcohol to entertain a horror of it. There is neither sense nor reason in taking up such a position, and there is no medical warrant, so far as I am aware, for it.

I am not speaking as a physiologist, but as a physician. The former has little or nothing to do with the acquired or practical habits of a social system. The latter has to take account of the everyday life and habits of all humanity in health and disease, and to find out the laws that hold good for the mass, discovering always where he can, as Sir Andrew Clark has pointed out, where the law of the individual traverses that which in general applies to the mass.

Abuse of anything in any degree, for us, constitutes disease or departure from laws which, to secure health, must be obeyed. We therefore recognize a legitimate use of alcohol which, as a physician, I feel sure is *food*, whatever the physiologists may say to the contrary. I have known life kept up by alcohol to the exclusion of all other ingesta save a little water; therefore I feel justified in reckoning it as a food for temporary use at all events.

We find the greatest numbers of the best men and women doing the best work that can be done in the world taking some form of alcohol with, as we believe, benefit to themselves and to their capacity for work. We find a very much smaller number of persons who can do as much and as good work without this; but even in their cases we believe that many of them would be the better for some form and amount of alcohol.

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* *Vide* National Review, May 1884 (Mr. Mott's contribution to this subject).

A very few persons never attain their best health till they cease to take even the little they formerly took. This is an idiosyncrasy, and not a law for everybody. These are the persons who, having found benefit from leaving off what for them was noxious, try to enforce on others the same abstention. But this is a common habit with the public, who find some particular remedy suit their case, and forthwith recommend it to all their friends, forgetting that the latter may not have the same complaint or any necessity for the treatment.

I know of no evidence to prove that a moderate consumption of alcoholic liquid, taken with other food, is injurious to the best health of the textures of the human body, or incapacitates it for its highest functions. I can give no exact definition of what moderation means in this matter for most people, but I will assume that the utmost limit or equivalent of alcohol taken in any day should not exceed one ounce or one ounce and a half, whatever the nature of the liquid taken.

I will add that this amount should be taken with a meal, and, as a rule, when the day's work is done. None should be taken between meals. I agree with those observers who find that any but the smallest amount is commonly harmful while the best work of the day is being done, and that persons in health require none before evening; but I do not follow many of them in going on to affirm that, because the least excess is harmful while the day's work has to be done, all alcoholics at any time are mischievous, and best dispensed with altogether. Much depends on habits and personal peculiarities. Such an amount as is not harmful, is not only, in my opinion, harmless, but positively beneficial for the majority of the inhabitants of civilized countries. Many advocates of total abstention have to admit as much as this; but, as one of them remarks, "this is a very qualified temperance," and is "an unnecessary indulgence, which encourages the dangerous desire to further indulgence."*

That I absolutely deny, and I regard such a statement as unfounded and unwarranted. Teetotallers affirm that an abstainer "is safe," which means that so long as he abstains he can never misuse alcohol. If a man uses alcohol at all, they say "he is unsafe" because of the indulgence in ever so small a degree. If this declaration refers to healthy persons I cannot agree to it, nor to the view that regards all alcoholic liquids as so dangerous, and withal so unnecessary, that they are in all cases best dispensed with. These are very old statements, and they have been often combated. My reply is that alcohol is a good gift to man, a good servant, a bad master. Like many other things, it may be used with impunity and with benefit, and abused at our peril. I conceive of man in his highest civilization and development as a finer being than one who must in order to live a godly life, deny himself the legitimate use of God's gifts.

To keep the moral laws it is not necessary, or even desirable, in my view, to deny any lawful appetite, but rather to exercise such control as

* "Diseases of Modern Life," p. 495, Dr. W. B. Richardson, 1876.

is enjoined by those laws; and I cannot doubt that a legitimate employment of alcohol is both allowable and beneficial.

I am, and have long been, convinced that total abstention from alcohol, both for its own sake and for its example to those who wilfully or ignorantly abuse it, is no remedy for careless and vicious indulgence. The abusers take little or no heed of such examples, and I would ask why do they not follow those who set them lives of exemplary temperance, to copy which are, now-a-days, nowhere far to seek? For those who have no control, and are wont to misuse alcohol, there can be no doubt as to the propriety of total abstention. But this brings us in face of vice and wrong-doing, which call for special treatment.

Such abuse is not in question under the circumstances now under consideration. Drunkenness is certainly the parent of teetotalism.

All who have studied the subject are agreed that children in health require no alcohol, and if it is desired to enforce abstention from it for life such a habit had better never be acquired at all. It should be a penal offence to supply any alcoholic liquors to anyone under the age of puberty. I think it not always advisable to change alcoholic habits in middle life. I have certainly known harm to come of such practice. We are all descended from an ancestry which has used alcohol more or less, and the habit is woven into us as it were; and in itself, as I believe, is not a bad one at this stage of our civilization. Much of our nutritional rhythm is thus dependent on this as on many other factors. By an interruption of this, suddenly or otherwise, harm may conceivably come not only to the bodily textures, of which I have certainly knowledge myself, but to the best working powers of the mental and moral natures. I am now speaking, be it remembered, of healthy persons using alcoholics in moderation, and have no doubt as to the absolute necessity of removing all such liquors from the inebriate or diseased individual. We take note of the value of a small amount of alcoholic liquid as a valuable aid to digestion in many healthy persons, who can also secure good and well-cooked food. The alcohol in these liquids contributing only a share of the benefit, but still often being indispensable, other non-alcoholised fluids proving inefficient as substitutes, or more commonly harmful.

When the food is coarse and badly cooked there is greater need for, and benefit to be derived from, some form of wholesome alcoholic beverage. We cannot ignore the anæsthetic properties of alcoholics as tending, in small quantities, which alone are requisite, to promote comfort, cheerfulness, and greater ability, therefore, to carry on the world's work. I lay stress on the taking of alcohol only at mealtimes, presumably at one meal only in the day, and never, unless medicinally, at other times. Any person requiring alcohol between his meals is a sick person needing medical care. Were this an universally recognized custom, there would be hardly a question relating to alcoholic intemperance to discuss or legislate for. In strict moderation, therefore, I see nothing harmful, but, on the contrary, much that is beneficial, in the use of alcoholics in the present stage of our civilization. The main points respecting its use

are mainly three: first, that little be taken; secondly, that in whatever form it be consumed it be good of its kind; and thirdly, that it be taken with meals. To these I would add that it is hardly possible for any routine to be followed day by day, few persons requiring the same amount which may well vary, or be undesirable altogether on some days. All that I have thus far ventured to affirm relates to the consumption of alcoholics by healthy persons possessing proper control of their appetites.

I offer no apology for my statements which controvert much teaching now prevalent. I am only concerned to say what I believe to be true, and I hold back nothing, believing that the propagation of truth is the best and the only irresistible weapon wherewith to combat error and ignorance. My remarks give no warrant for alcoholic misuse or intemperance in any degree.

The medical profession has unquestionably great power in checking formation of habits of alcoholic intemperance. For the sick the use of any kind of alcoholic drink is a matter of prescription of equal importance with that of any medicinal substance. It is an agent of great power and value in many forms and phases of disease, and no substitutes that I know of can take its place with equal advantage.

The greatest distinctions must be made between the different kinds of alcoholised fluids and spirits consumed as such. The peculiarities of patients as of ordinary persons have to be studied, as have also the characters and properties of the various drinks. Whatever is consumed should be good, and much harm to the cause of sobriety comes from the use of bad liquors.

I now come to the question of misuse of alcohol which I call a vice. In this case we have to deal with ignorance and with careless want of moral control. The vice of intemperance is an appalling matter, and especially because it leads but too often to the nervous disease of inebriety.

It is a matter of difficulty to determine when the habits of intemperance pass into the conditions of disease. My belief is that inherited nervous disease is commonly the cause of the alcoholic habit. This nervous instability is certainly often the result of ancestral alcoholism, but it is also often quite unconnected with a taint of this kind. In such cases, we have practically to deal with a form of insanity, for which the sufferer is no more to blame than an epileptic or a maniac. He is therefore irresponsible and a source of mischief and evil example in any community. Such unfortunate patients should fall to the care of the physician, and are to be discriminated by him from those who are the victims of a self-indulgent and careless vice demanding adequate punitive treatment. The public and the magistrates are incapable of making this discrimination, and commonly confound the two classes of cases. The careless, vicious drunkard may ultimately become an insane and irresponsible one, and so pass into the other category.

The question of the misuse of alcohol must be kept entirely apart from that relating to the use of it. Misuse constitutes an offence which may be either privately or publicly harmful, and must be reckoned and

dealt with as a vice. The over-stepping of moderation must thus be stigmatized, and is so regarded now-a-days by the respectable classes of society. Amongst the poorer and ignorant classes drunkenness is so common that it hardly attracts attention or causes any stigma unless it leads to actual cruelty or crime. It is to be hoped and expected that with the spread of knowledge and education, alcoholic intemperance may come to be regarded always and everywhere as vicious and reprehensible. It is a grievous matter that it should be lightly regarded in any quarter as a venial offence, and I should gladly support some more rigorous forms of punishment for the vice of occasional intemperance than can now be meted out.

I think the possibility of some legally enforced personal stigma would prove deterrent and wholesome, if early applied.

Inasmuch as many careless and vicious drunkards cannot be made to smart in their conscience, I believe that the infliction of corporal punishment would be useful against repeated lapses from sobriety.

Vice should always and everywhere be punished, and the present tendency to minimize punishments is unwholesome, and indicative of a general flabbiness and sentimentalism in society which is quite unwarrantable and mischievous.

I am of opinion that the electoral franchise should be withdrawn from every drunkard after a second conviction of his offence.

The line dividing the responsible from the irresponsible inebriate may, I conceive, be fairly drawn where occasional lapses from sobriety pass into incorrigible habitual intoxication. The habitual drunkard is on all hands recognized as a pest of society, and is, as far as my present experience goes, practically, in almost every instance, irreclaimable. All efforts to reform such a person are and must be costly. Voluntary or compulsory incarceration for a short period is in most cases of proved inutility, leading only to restored physical health with renewed capability to begin a fresh bout of inebriety. The stigma attaching to confinement in any asylums adapted for reform must always be severe, and harmful to the subsequent career of such patients as are submitted to it. The expense of such confinement must also be a heavy tax on the relatives and friends of such persons, and if all the impecunious habitual drunkards were to be thus treated, the cost to the community supporting such asylums would be simply intolerable. It is well to recognize at once that the habitual drunkard is practically an insane and mischievous individual, and his future life of questionable value to the State.

It is a sad thing to say, but I know of no certainly approved and tried means for the real reform of such persons. There is, as yet, no evidence that prolonged incarceration with suitable environments, which exclude dangerous contact with other inebriates, is of avail, and I know of no arrangement at present by which such isolation could be secured for the number of insane drunkards to be found in almost every community. The prospects in the case of female inebriates are notoriously worse than in the case of males, reformed drunkards amongst women being hardly ever met with. The recognition of the fact that habitual drunkards are in many cases practically insane persons, and not

generally very difficult of recognition as such, appears to demand consideration for them in accordance with such a view. Seclusion is the remedy proposed, together with suitable moral and medical treatment. It is objected that in such a system many criminal inebriates would be treated as diseased individuals, and that the former should rather be dealt with by the magistrate than by the physician. In my opinion, the majority of habitual drunkards are the victims of a pernicious habit, demanding much severer punitive treatment, cumulative in character, than is commonly meted out to them. It would be a monstrous thing if vicious tipplers could claim indulgence for their sins on the plea that they were insane and therefore irresponsible.

For the truly insane drunkard, however, I am of opinion that some effort should be made to remove him from access to drink and to secure proper medical treatment. We have yet to gain experience as to the effects of such management carried on over a long period. It might be tentatively carried out and studied, and the expense of it borne by the relatives where possible as in other cases of insanity.

Respecting the evils of alcoholism and its baneful effects on society there can be no two opinions. All thoughtful persons recognize the waste, misery, disaster, and crime of which it is the parent. Most persons recognize also that the facilities for procuring, and the temptations to take, alcoholic drinks are far too great, and should be resolutely checked. The number of places in which they may be had is too great, and the supervision of their management is inadequate and insufficiently paternal.

The lives of publicans and of their wives, children, and servants are notoriously precarious, and their business dangerously seductive.

I am in favour of a measure of local option in respect of the number of public houses and licensed places for the sale of alcoholics in any community or parish, with a much more rigid supervision of the conduct of the frequenters of such places.

It is probable that much benefit to the cause of temperance would follow if licensed houses for the sale of drink were compelled to close earlier in the evening than is now the custom.

I trust far more to the benefits to be ultimately derived from the spread of education generally, and the formation of a healthier opinion on the use of alcohol, to a reform in many old and stupid habits of drinking on various occasions, and to the influence of strictly temperate habits spreading and affecting larger circles of society as time progresses.

But I trust most of all to the spread of Christian education and to the simple but unfailing influence of the fear of God in men's hearts. I have infinite faith in that. No legislation is likely to be so complete and saving. And here and now I will say that such is the faith of the great profession I represent. On one occasion after expressing this view in public, a German gentleman came to see me, and said "I am surprised "and gratified to hear such sentiments from a doctor, for in my country "the doctors have no faith in such matters. But in your country the "doctors have faith."

Thank God we have it, and we mean to hold on by it. It was good for our forefathers, and it is good for us, and will be for those who come after us. It will do all our work and guide us in carrying out all needful reforms. It is rather the fashion now-a-days to have too little faith, and to fall back into scepticism or indifference because we confound the difficult dogmata of theology with the practical faith which alone inspires. a simple Christian life. The former is for scholars, and the latter is for everybody, however unlettered. Let us have the simple faith which a child learns at its mother's knee, and that will save all humanity from its woes and its intemperance. When that faith is found upon this earth we shall have reached a veritable Hygieia, and be ready to accomplish all the ends which are sought by the noblest and most aspiring amongst those who come together to take their part in such a Congress as this.

Preventive medicine clearly teaches that the children of vicious and insane drunkards should never touch alcohol, and that the liquor traffic should be generally more firmly controlled by the State, and by municipal and parochial authorities.

I maintain that legislative measures of abolition are both ineffectual and undesirable, unworthy of our present civilization and profession, not warranted by experience nor likely to promote the highest interests of humanity. If our Christianity is anything better than a name such measures are uncalled for.

The Church in this country now well-recognizes its sphere of usefulness in promoting a sound opinion on the whole matter, and it will do its best work, as I think, in encouraging wholesome temperance for the masses, and abstention only where necessary.

If such measures as better dwellings, abundant supply of pure water, shortened hours of labour, compulsory education, more holidays, more places for wholesome recreation do not work gradual amendment in gross alcoholic excesses, I, for one, should not despair, for I believe in none of these by themselves availing more than to give men a better chance to lead righteous and God-fearing lives. Add to all these a diligent teaching and enforcement of God's laws, implant the fear of God in every man's heart, and promote the cultivation of a simple saving Christian faith, and at once we lay the axe to the root of the great Upas tree of alcoholism and of all other forms of intemperance and sin.

Many enthusiasts and laborious workers in this cause are of opinion that it is impossible to be in earnest or to do any real good for it unless total abstention be both practised and enjoined.

I must join issue with them, and will only add that I, for one, am as much in earnest in the whole matter as they can be, and that I have no doubt whatever that the principles I maintain are these that will ultimately prevail, and compose for ever the troubles and differences that rage just now over this matter. Let us be thankful for earnestness anywhere. That is a hopeful sign. Better to be earnest than indifferent; better still, as I think, to be free and yet sober.

Alcoholism in relation to Public Health, and the Methods to be Adopted for its Prevention.

BY

HARALD WESTERGAARD, Professor of Political Economy in the University of Copenhagen.

An exhaustive solution of this question would require reliable details concerning the consumption of intoxicating liquors, but here we meet with great difficulties. In many cases the only fact given will be the average quantity consumed per head of population, and even this is not always stated correctly. But it is evident that the effect of alcoholism on public health depends not only on the average quantity consumed, but on the distribution of this quantity. Two countries consuming the same quantity of spirits per head of population may suffer very differently from their effects; in one country the quantity is perhaps uniformly distributed, whereas in the other there is a great number of total abstainers and of those habitually temperate, the mass of the intoxicating liquors being consumed by a small minority of the population. Evidently in the latter case the effects of alcoholism will present themselves in a much more appalling form than in the former. In the absence of facts showing this distribution it will be expedient to look for other data indirectly indicating the extent of intemperance. In most countries, for instance, more or less complete data regarding divorces of marriages can be had, and in several countries we will find that an enormous part of the divorces bear some relation to the abuse of strong liquors. The number of persons in different parts of the country who are somehow or other concerned in the liquor trade are also very illustrative of this question, if the great extent of the smuggling trade does not render them too inaccurate. Or I may mention the statistics of poor-houses and lunatic asylums, where the inmates very often are the victims of intoxicating drinks. The large number of police offences and crimes caused by alcoholic excess will show to what an extent in many countries alcoholism claims the attention of the public.* It has been tried several times to show the effects of habits of intemperance on mortality. We have thus a series of observations on the mortality among innkeepers, publicans, hotel servants, and persons in other trades tempting to indulgence in intoxicating drinks. The last supplementary report of the Registrar-General of Marriages, Births, and Deaths in England contains valuable facts of this kind, showing, for instance, for innkeepers between twenty-five and sixty-five years of age a mortality more than 50 per cent. higher than for the total population, whereas hotel servants presented an increase of 120 per cent. above the average rate of mortality,

* A considerable number of facts bearing on these questions will be found in Dr. A. Baer's new work, Die Trunksucht und ihre Abwehr; Wien und Leipzig, 1890.

being, among all the occupations chosen, that which shows the highest rate of mortality. Dr. Farr has found during an earlier period that at the age of twenty-five the mean after-life time of publicans was thirty-one years, among the whole population thirty-six years, and of the clergy forty-two years, the latter being thus eleven years in advance of the publicans. But this high mortality is not an absolutely exact proof of the effects of intemperate habits. On the one hand, a number of the publicans may be supposed to be habitually temperate, the effects of intemperate habits on the remainder thus being so much greater; on the other hand, the high mortality may partly be ascribed to other causes, such as night work, unhealthy and ill-ventilated rooms. Still an examination of the causes of death will show that a considerable part of the high mortality is due to alcoholic drinks.

Another series of observations directly bears on the mortality among persons with different habits as to intoxicating liquors. To this class belong the experiences of the United Kingdom Temperance Institution, showing in the temperance section a mortality which is only three-fourths of that in the other section. These remarkable results are corroborated by other facts, as I shall try to show further on; but the principles adopted for these investigations having, as far as I know, not been published, they must as yet be accepted with some reserve. Another interesting and frequently quoted investigation is contained in Neison's great work, "Contributions to Vital Statistics," showing an appalling mortality among persons decidedly addicted to drinking, the number of deaths expected according to the mortality of the whole population being 110, whereas the actual number of deaths was not less than 357. The name of the author has secured to the investigation a great reputation, but we cannot altogether rely on it, the methods being not unobjectionable. On examining Mr. Neison's paper it will be found that the number of deaths is exactly equal to the number of persons "exposed to risk." We have thus only observations on persons who died during their exposure to risk, but not on those who outlived it. We would, therefore, not be able to find from these observations the mean duration of life among drunkards, but only their mean age at death. The great difference between these two expressions is well known. I may here only quote one proof by Dr. Farr in his posthumous work, "Vital Statistics," p. 457: He found that, whereas the mean duration of life in Sweden at the beginning of this century was thirty-nine years, and in England, somewhat later, forty-one years, the mean age at death was respectively thirty-one and twenty-nine years. Judging only from the latter calculation, a statistician would be led to the conclusion that the mortality was smaller in Sweden than in England, whereas in reality at that time the reverse was the case. The only difference between this statement about the mean age at death and that which would have been found from Mr. Neison's observations is this: that the latter only date from the day the persons under observation were supposed to begin their intemperate habits, and not from their birth or some fixed age; but in reality the principles are the same. The only way of getting correct materials would be to watch a number

of drunkards during a certain period just as a life office follows the insured persons from one year to another, calculating the rate of mortality among the whole number exposed to risk. It would not be difficult for a body of medical men to collect useful data of this kind by following for some years persons of intemperate habits among their clients.

An interesting investigation, corresponding to Neison's, has recently been made by Dr. Isambard Owen, who has calculated the mean age at death of persons of different habits with regard to intoxicating liquors.* It was found that the mean age at death for total abstainers was eleven years shorter than that of "habitually temperate" persons (exactly the same difference as found by Dr. Farr between the mean duration of life for publicans and clergymen) and one year shorter than of "decidedly intemperates." This result may arise solely from the fact, suggested by Dr. Owen in explanation, that the total abstainers are more frequently found in the younger generation than in the older; for among young persons naturally several premature deaths will take place, thus reducing the mean age at death. But the report gives very interesting particulars in two other directions. First, as to the causes of death, which are carefully recorded in Dr. Isambard Owen's paper; secondly, as to the distribution of the population according to different habits. It appears from the report that about one-seventh to one-sixth of the persons under observation were decidedly intemperate; about the same number were "free drinkers"; and more than one-fourth "careless drinkers," leaving only somewhat more than two-fifths for total abstainers and the habitually temperate. It may be objected that, as the mortality among intemperate persons is probably much greater than among temperate persons, the former class will show proportionately more deaths than the latter; but, even if this would diminish the proportion of intemperates considerably, the fact remains that a very great part of the male population in England must be said to be addicted to drinking.

What is now the effect of alcoholism on public health? What are the losses of life caused to a population by intemperance? This question can to a certain extent be answered by examining the causes of death, especially delirium tremens and chronic alcoholism. It has been objected that these causes of death supply an unsatisfactory picture of drinking excess, because the wish to spare the feelings of surviving relatives makes returns of such deaths less trustworthy, and it has therefore been proposed to use other diseases as a measure—such as liver disease (especially cirrhosis of the liver). Yet it is worth while to examine the above-mentioned causes of death. Through the courtesy of the Danish statistician, Dr. Carlsen, I have been enabled to study the mortality from these causes during a year in different classes of society in the urban population of Denmark. I have thus found that among males above twenty years of age from 5 to 6 per cent. of all the deaths registered were ascribed to delirium tremens, chronic alcoholism, and sudden death

* Brit. Med. Journ., June, 1888.

in drunken fits (*mors inebrietate*, not including fatal accidents). In one-third of all these cases a combination of some of these causes with other causes was registered, but in reality the number of such cases is undoubtedly much greater, thus giving the above-named percentage a considerable increase. In the class of working men the proportion is still greater, as will appear from the following table :—

Age.	Whole Male Population.			Working Class.		
	Total number of Deaths.	Deaths from Alcoholism.		Total number of Deaths.	Deaths from Alcoholism.	
		Absolute number.	Percentage.		Absolute number.	Percentage.
20	218	1	—	100	1	—
25	396	24	6	198	19	10
35	517	48	9	255	25	10
45	581	52	9	220	25	11
55	756	43	6	248	22	9
65	604	20	3	151	7	5
75	524	5	1	72	2	—
Total	3,596	193	5·4	1,244	101	8

Out of twelve adult working men who died, one has thus fallen a victim to chronic alcoholism, &c., and between the ages of twenty-five and sixty-five, 10 per cent. of all the deaths were ascribed to these causes.

If we calculate the influence of these causes on the table of mortality. we find that if these causes had not taken place, out of a certain number of males twenty years old, 12 per cent. more would reach the age of 75 than is the case now, and among working men even 15 per cent., and the mean duration of life would be increased by more than a year for an adult male person. Curiously enough, the mean duration of life for the two sexes, according to the Danish life-table, would under this supposition be nearly equalised. Immense as appear these losses of life, they are undoubtedly much greater in reality. It may be that the number of cases of delirium tremens and chronic alcoholism is approximately correct for the working class, and somewhat too small for the remainder. But, besides, we have numerous cases of liver disease (cirrhosis of the liver) and other diseases caused by drinking, not a few accidents due to the same cause, and, moreover, a considerable number of suicides connected with intemperance. Out of 100 male suicides in the towns, about 44 were notoriously given to drinking, the absolute number of these cases being 50 to 60 every year. A still more striking fact is the following observation from the town hospital in Copenhagen. Out of 850 persons above twenty years of age treated for pneumonia, 558 were males, and 292 females, and of these 558 males more than one-half—viz., 285—suffered from chronic alcoholism or delirium tremens (not to speak of those suffering from *delirium febrile*), whereas only eight female patients were attacked by these diseases. Subtracting these numbers, we find

about the same number of male and female non-alcoholists. It is also an interesting fact that among the 285 male patients suffering from alcoholism and delirium one-fourth died, whereas among the others only 13 per cent. died.

It is thus not improbable that the real losses of life on account of drinking are much greater than they appear to be from an examination of the tables of deaths directly due to alcoholism and delirium, and these effects of strong liquors are still more striking if we compare them with the mortality statistics of the Norwegian capital, Christiania. Whereas in Denmark there is a small excise on spirits, Norway has a very high one; and whereas Copenhagen has an excessive number of publicans—one for every 300 of the inhabitants—the Norwegian capital has only one public-house for the sale of spirits for every 5,000 inhabitants. In Christiania, according to a communication to me from Dr. Berner, inspector of health, during twenty years only 76 deaths from alcoholism, and delirium tremens have taken place, 65 among males, 11 among females; and there is reason to believe that the actual number of deaths from these causes is only slightly higher. Only two thirds per cent. of deaths among adult males have been due to these causes, while in Copenhagen the corresponding number was 5 per cent.; and while the suicides in Christiania were only 2 per cent. of the deaths among adult males, the corresponding figure in Copenhagen was 4 per cent. These facts speak very clearly of the effectiveness of the measures adopted in Norway, which have reduced the quantity of spirits consumed in that country to one-fourth of what it is in Denmark.

Bearing in mind the fact that in a population including total abstainers and temperates, as well as free drinkers and drunkards, the percentage of deaths ascribed to alcoholism in the range of age from which insurance companies are principally recruited is 5·4 per cent., we can understand that a temperance section of a life office does have such a favourable experience as stated above.

In most countries the statistics of the causes of death do not allow conclusions with regard to alcoholism corresponding to those for Denmark and Norway. But at all events the statistical data sufficiently show that a great part of the civilised world is suffering greatly from the effects of alcoholism. The investigations of the Harveian Society make it probable that in London one-seventh of all adult deaths (males and females) is directly or indirectly due to the consequences of alcoholic excess. But even confining ourselves to the number of deaths stated by the official statistics—probably only a fraction of the real number—we find in England an enormous loss of life. The mortality from alcoholism in 1871–80 among males 25 to 65 years old was about 1 per cent. of all deaths—nearly 800 yearly. What an amount of disease and poverty, of moral and physical degradation, is represented by these 800 deaths! In Belgium the yearly loss of life from delirium tremens among males, was 330 in 1870–89. Still greater have been the devastations of drinking in Switzerland. Prussia has a yearly loss of 1,100 males from delirium tremens. Undoubtedly we should find, if reliable data could be had,

that chronic alcoholism and delirium tremens alone kill many thousands of men every year.

What is to be done? I think that if the only result of this discussion were that the medical profession in all civilised countries were carefully to register all the cases of alcoholism within their reach, thus giving us a complete and reliable collection of data as to the effects of intemperance, we might congratulate ourselves, for nothing would serve better to open the eyes of the public. Medical men have it in their power through such investigations to render to society an invaluable service.

I may just in a few words touch upon the private efforts for diminishing alcoholism through public coffee rooms, temperance societies, bands of hope, &c. These efforts have undoubtedly saved many persons and families from moral, physical, and financial ruin, and they are necessary to quicken public opinion against strong drinks, and prevent the laws against intoxicating liquors from becoming a dead letter. Undoubtedly, homes for the cure of habitual drunkards, with or without State assistance, will prove useful when properly managed. Whether the efforts to ensure pure alcohol, with fines for the adulteration of alcoholic drinks, &c., will prove salutary, or perhaps only produce more refined forms of drunkenness, seems to me rather more doubtful. Much harm may be done by recommending a pure drink in order to diminish the consumption of an impure one, and as far as I know no definite statistical proof has as yet been found that such a measure alone would tend to diminish intemperance. It has also been proposed to deprive drunkards of their freedom in financial matters, declaring them minors; and this, in addition to other measures, may help to create a public opinion against alcoholic excess, as well as the proposed alterations in the criminal laws punishing crimes committed in a state of drunkenness as, or even more, severely as those committed in a sober state, not to mention laws and police provisions against drunkenness.

High excises are generally looked upon as an excellent weapon against alcoholism. But we must not forget that even a very high excise, as in England, does not prevent spirituous liquors from coming within the reach of anybody, so long as the number of public-houses is so exceedingly large as in this country. If a person has to go a long way to get drunk, and if he has in addition to pay a good sum for it, he will stop to think before going. Still, high excises seem to have some effect: the German law of 1887 has, for instance, reduced the consumption of spirits to a certain extent. But generally the reduction of the consumed quantity does not seem to correspond with the increase of the excise. An interesting expedient is the new State monopoly in Switzerland. Ten per cent. of the surplus are left to the cantons for counteracting alcoholism. By regulating the price the monoply acts like an excise, and the Government takes care that only unadulterated liquors are sold. The monopoly is reported to have had a good sanitary effect, and it has caused some decrease in the consumption of liquors.

In connexion with excise and duties every effort is to be commended which tends to render the access to intoxicating liquors more difficult. Among these measures the three popular American systems deserve our

attention—viz., the "Maine laws," "local option," and the "high licence" system. The first of these expedients, the prohibitory system, has been tried in Maine and some other American States. According to this system, it is prohibited to manufacture and sell intoxicating liquors, the only exception commonly being that liquors of "foreign production" may be imported and sold in the original packages. But this exception is unjust, permitting the man who can afford it to order as much liquor as he likes, and nearly all reports agree in testifying to the perpetual violations of these laws. I shall only mention one curious fact from Maine, where the system was adopted in 1881. During the years 1867–86, 8,412 divorces of marriages took place, being probably several per cent. of the yearly number of celebrated marriages. Of these no less than 960, or 11 per cent., were caused by intemperance, combined or not with other causes. It thus seems that intemperate habits are rather frequent in this State. Curiously enough, the State of Massachusetts (where there is a considerable revenue from licences) shows, under nearly the same regulations concerning divorces as in Maine, the same proportion —viz., 1,054 out of 9,853. It seems impossible to suppress the liquor traffic in the larger towns. Between the Maine laws and the high licence system is an intermediate system, local option. According to this, it is left to the citizens of a village, town, city, or a larger district to vote for local prohibition. This system seems to work somewhat better than the Maine laws, and it may prove useful in rural districts, the control in small communities being more easily carried through; but in larger towns it is probably ineffective, tempting as it does to a surreptitious liquor traffic. The third system—high licences—has been introduced in several States. Under this system licences for the sale of liquors can be taken out, but the fees are so considerable (for instance, 500 or 1,000 dollars yearly) that many small saloons disappear. In some cases the sale of liquors through grocery stores is entirely stopped (Illinois). This system is reported to work well by reducing the number of drinking saloons, thus lessening the opportunity for drinking. It is maintained that "the high licence system has thrown the liquor traffic into the hands of a more respectable class of dealers," and that those who pay high licences "help the authorities in the conviction of "breakers of the law, under the fundamental principle of self-preservation."*

It is also to be recommended to limit the numbers of licences that may be taken out. This is the case with the Dutch law of 1881. Under this law the highest number of licences in a town with more than 50,000 inhabitants is one for every 500 inhabitants; in places with from 20,000 to 50,000, one licence for 300; and in smaller places one for every 250; and the licence is only given for one year. Though the limits fixed by the Act are very liberal, and seem to be maintained very leniently, it has reduced the number of places where spirits could be had very considerably. Still more effective have been the efforts

* Report on Liquor Traffic Legislation in the United States. Foreign Office, London, 1888, pp. 34–5.

in Sweden, Norway, and Finland. The numbers of bars have been gradually greatly reduced, especially in the rural districts; and in most of the towns the so-called "Gothenburg system" has been introduced. According to this system, adopted since 1865 in Gothenburg, all or most of the licences in a town are given to a company which is not allowed to pay more than a fixed rate of interest to the shareholders, the surplus being spent for the benefit of charitable institutions or forming part of the municipal income. The result has been a great reduction of the number of bars. In Gothenburg the Company in 1865 took out forty licences, but at once reduced the number of saloons to twenty-three. The persons who manage the saloons get a fixed salary for the sale of spirits, and are therefore not tempted to encourage the customers to drinking. Moreover, there is a limitation of the hours during which the saloons are open, and other steps have been taken to prevent abuses. Undoubtedly this system—in connexion with the great diminution of the number of bars in the rural districts of the country—has contributed very much to the conspicuous reduction of the alcoholism in the three countries before mentioned. A very practical expedient is also the prohibition of sale of intoxicating liquors at groceries and similar shops, and this provision ought never to be omitted where steps are taken to limit the number of saloons. And last, not least, it is highly desirable to regulate the opening hours of the saloons. This, as we have seen, is one of the features of the Gothenburg system. In England there is a reduction of the licence fee for those who close early on week days, and in the same country (and, as far as I know, also in Holland) we meet a similar provision concerning the non-opening on Sundays. In some countries the opening on Sundays is altogether forbidden, or at least confined to certain hours. In Norway the sale of spirits is even forbidden from Saturday afternoon till Monday morning. Of course a population must be gradually accustomed to such restrictions, but where this has been the case, as in Norway, provisions like these seem to work very well. Undoubtedly they have contributed not a little to the great diminution of drunkenness in Norway, for it is on Saturday night and on Sundays that the strong liquors gather their richest harvest.

None of the recommended expedients are, of course, quite exhaustive. Every country will show alcoholism and delirium tremens as causes of death whether a high licence or the Gothenburg system is adopted—drunkards will exist even where it is very expensive to get drunk and the opening hours of public-houses are very few. But the combined action of such measures will, at all events, be a great saving of life, a great diminution of misery; and until it has been proved that prohibitory laws (Maine laws) may be carried through without opening the doors for smuggling and other abuses, total abstainers and temperates might well agree in recommending some of the proposed measures, or all of them.

Orientirendes über die Alkoholfrage in der Schweiz.

VON

Herrn E. W. Milliet, Bern.

Die Prohibition will ich hier nicht ausführlich kritisiren. Mir scheinen die Prohibitions-Gesetze auch derjenigen Staaten, in denen deren Durchführung als eine geregelte gepriesen wird, wie Maine's, immer das Anstössige einer unmotivirten Klassengesetzgebung an sich zu tragen.

Der Arme kann sich in den amerikanischen Verbotstaaten geistige Getränke nur durch Gesetzesübertretungen verschaffen, da die für seine ökonomischen Kräfte zugänglichen Wege des Detailhandels de lege verbarrikadirt sind.

Der Reiche hat in dem bundesrechtlich freigelassenen Grosshandel ein Mittel an der Hand, sich wenigstens in seinen vier Pfählen zu betrinken.

In Europa ist die Einführung der staatlichen Prohibition bei dem dermaligen Stand der öffentlichen Meinung einfach unmöglich. Aber auch die Wissenschaft hat ihr letztes Wort über die physiologische Rolle des Alkohols und damit über die Wünschbarkeit und Möglichkeit eines staatlichen Verbots seines Genusses noch nicht gesprochen.

Ich erinnere an eine Entdeckung neueren Datums, der zufolge durch die Mikroben des Dünndarms und das Bacterium commune des Dickdarms aus der aufgenommenen Nahrung eine merkliche Menge Alkohol in unserem Leibe erzeugt werden soll. (Macfadyen, Nencky und Sieber.)

Wenn ich mich indessen auf der einen Seite gegen die Prohibition ausspreche, so anerkenne ich auf der andern, dass die freiwillige Enthaltsamkeit vom direkten Genuss geistiger Getränke weder vom Standpunkt der Religion, noch des Rechts zu beanstanden ist. Die Vertreter vernünftiger und sachlich geführter Abstinenzbestrebungen sind gute Hilfstruppen in dem Kampf gegen den unmässigen Verbrauch berauschender Getränke. Gegen das Uebermaass im Trinken ist mit allen rechtlich und sittlich zulässigen Mitteln vorzugehen. In diesem Kampfe ist zu unterscheiden zwischen destillirten und gegohrenen Getränken; letztere sind als die weniger schädlichen zu betrachten und demgemäss zu behandeln. Es ist ferner darauf hinzuwirken, dass die geistigen Getränke jeder Art von unreinen Bestandtheilen möglichst befreit und gegen Verfälschungen geschützt werden.

Für die lebhaft empfohlene, auch heute wieder in den Vordergrund gestellte Reduction der Schankstellen als Mittel zur Eindämmung des uns beschäftigenden Gemeinschadens kann ich mich nicht begeistern. Alle Erfahrungen beweisen, dass die Herabsetzung der Zahl der Wirthschaften wohl gelegentlich und in besondern Fällen eine Beschränkung des Wirthshausübels oder des Alkoholismus oder beider Schäden zugleich bewirken kann; ein allgemeiner und sicherer Erfolg

ist von der Massregel nie zu erwarten. Dieselbe leidet überdiess an Unzuträglichkeiten auf rechts-politischem Gebiet.

Die Erfahrungen, speziell der Schweiz, zeigen uns, dass die Auflage von Branntweinsteuern als Mittel sur Einschränkung des Branntweinkonsums nur in Verbindung mit einer Steuerentlastung der gegohrenen Getränke einen sichern und dauernden Erfolg versprechen.

Auch zeigen im Besondern wieder die Verhältnisse meines Landes, dass die kleinen landwirthschaftlichen Brennereien da, wo eine strenge Ordnung ihrer Verkaufsweise nicht besteht, Hauptheerde des Alkoholismus sind.

Der Redner schliesst, indem er an einzelnen wichtigeren Punkten darzulegen sucht, dass das Monopol, wie es die Schweiz in allerdings erst rudimentärer Gestalt besitzt, für die Durchführung einer Reihe von Massnahmen gegen den Alkoholismus bessere Garantien biete, als jede andere Form des gesetzgeberischen Einschreitens.

The Effects of Alcoholism on Public Health.

BY

John G. Phillips, Secretary to the Sceptre Life Association.

Having been invited to make a communication to this Congress as to the effects of alcoholism on the public health, I cannot do better than briefly state the experience of the Sceptre Life Association, with which I am connected.

The Association was established in 1864 to effect assurances chiefly upon the lives of members of religious bodies, as the founders of the Association believed that a lower rate of mortality prevailed among that class of people than among the general public in consequence of their more careful habits and quieter mode of life; and as it was believed that total abstinence from intoxicating drinks was conducive to longevity, a separate section was formed for total abstainers, with the result that up to the end of 1883 a much lower death rate prevailed in that section than in that for non-abstainers.

The quinquennial valuation to the end of 1888 was made by Mr. H. W. Manly, an actuary of high repute, who adopted the Institute of Actuaries' H^M Table as being more accurate than the Carlisle Table, which had previously been employed. Mr. Manly in his report states:—

"In order to arrive at a fair division on the present occasion, I have compared the actual claims in each section during the past five years with the claims that might have been expected according to the Institute of Actuaries' H^M Table. The result is as follows, and will, no doubt, prove interesting."

MORTALITY EXPERIENCE, 1884–1888.

Ages at Death.	General Section.					
	Policies.			Sums Assured and Bonuses.		
	Expected.	Actual.	Percentage Actual is of Expected.	Expected.	Actual.	Percentage Actual is of Expected.
19 - -	·5	—	—	60	—	—
20–29 -	24·2	15	62·0	3,991	3,756	94·1
30–39 - -	84·1	60	71·3	14,601	12,373	84·7
40–49 - -	134·5	101	75·1	23,095	18,670	80·8
50–59 - -	107·6	85	78·8	16,654	16,522	99·2
60–69 - -	81·5	65	79·8	11,758	8,850	75·3
70–79 - -	29·3	39	133·1	3,677	6,206	168·8
80 - -	4·4	3	68·2	480	220	45·8
All ages -	466·1	368	79·0	74,316	66,597	89·6
	Temperance Section.					
19 - -	1·1	1	90·9	171	100	58·5
20–29 -	30·9	19	61·5	4,785	3,097	64·7
30–39 - -	54·5	25	45·9	8,771	5,230	59·6
40–49 - -	53 5	23	43·0	8,565	5,861	68·5
50–59 - -	31·0	23	74·2	4,581	4,649	101·5
60–69 - -	16·9	12	71·0	2,786	2,786	100·0
70–79 - -	5·9	7	118 6	841	1,042	123·9
80 - -	1·3	—	—	145	—	—
All ages -	195·1	110	56·4	30,645	22,765	74·3

The mortality for the two succeeding years was as follows:—

—	General Section.			Temperance Section.		
	Expected Claims.	Actual Claims.	Per Cent.	Expected Claims.	Actual Claims.	Per Cent.
1889	103	66	64·07	54	33	61·11
1890 -	110	93	84·54	57	31	54·38

So that the totals for the past seven years were—

Section.	Expected Deaths.	Actual Deaths.	Percentage.
General - - -	679	527	77·61
Temperance - -	306	174	56·86

A comparison of the average ages at death in both sections may be of interest, proving as it does, when read in the light of the foregoing statistics, that any deductions from the mere ages at death without reference to the ages of the living groups from which they are drawn is most misleading; the number of deaths as already given was for the seven years ending 1890, 527 in the General Section, and the average age at death 51·5; while during the same period the deaths in the Temperance Section numbered 174, and the average age at death was 44·8.

We find that the percentage of deaths from diseases of the heart, brain, nerves, and digestive organs, is much lower among abstainers than non-abstainers.

Up to the end of 1888 the number of policies issued by the Association was upwards of 20,000, of which 11,227 were in force at that date, 6,700 being in the General Section, and 4,527 in the Temperance Section. The latter is now gaining ground much more rapidly, as out of 4,112 policies issued since 1885, 2,404, or upwards of 58 per cent., are in that section.

Perhaps I cannot more fittingly conclude than by giving the following quotation from a London commercial paper in a recent review of the Annual Report of the Association :—

"Once more the Temperance Section wins. And it certainly does appear singular that in regard to the single factor of the use or non-use of intoxicating liquors so marked a difference should arise, and especially in an association where the great bulk of the assured belong to the religious class, and among whom, therefore, it may be presumed, if intoxicants are used at all, their use will be strictly within the limits of moderation."

DISCUSSION.

Dr. Norman Kerr, F.L.S. (London) President of the Society for the Study of Inebriety, said that the loss of life through alcoholism was appalling. As the issue of an extended series of inquiries into the mortality from alcohol (the figures having been laid before the British Medical Association and other learned societies and pronounced "moderate" and "within the truth"), he had estimated the number of deaths prematurely occurring in the United Kingdom of Great Britain and Ireland every year at 40,000 from personal intemperance. To this direct annual premature fatality of 40,000 inebriates, there must be added double that number of deaths of individuals occurring, *not* directly from their own habits, but indirectly through accident, violence, starvation, neglect, and disease, occasioned by the alcoholic indulgence of persons other than those slain by alcoholic poisoning. A terrible slaughter truly, and achieved at great pecuniary cost. The average worth of an adult to the community had been reckoned at 2*s*. per day. Deducting Sundays, this made 31*l*. 6*s*. per year (313 days at 2*s*.). If they allowed five years of working capacity on an average to each adult life thus cut short, this would give 156*l*. 10*s*. as the current value of each life (five years at 31*l*. 6*s*. per annum). 40,000

lives prematurely lost from inebriate addiction, at 156*l*. 10*s*. per head, would amount to 6,260,000*l*. of wealth lost to the nation every year from alcoholic personal excess.

The waste from alcoholic disease, over and above the waste from alcoholic deaths, was most serious. There were generally acknowledged to be at least 39 cases of non-fatal disease to each case of disease ending in death, with (as they had seen) an average value to each individual of 2*s*. per day. The average duration of each such illness was 18 days. The 40,000 deaths prematurely happening through the alcoholism of the deceased, multiplied by 40, gave 1,600,000 as the total number of illnesses yearly. This, multiplied by 18 (the average number of days in each illness), gave 28,800,000 days in each year, during which adults were incapacitated for work from alcoholism. At 2*s*. per day, there would therefore be a money loss during the 12 months, from alcoholic intemperance, of 2,880,000*l*.

Dr. Norman Kerr said that on that occasion he left out of the reckoning altogether the considerable number of premature deaths and of attacks of non-fatal maladies arising from alcoholic indulgence in quantities commonly called "moderate," "free," and "generous"; though the records of the United Kingdom Temperance and other insurance companies and friendly societies showed that this would have made a very substantial addition to the saddening tale of alcoholic death, disease, and consequent money extravagance. To these fell to be added a large proportion of expenditure on pauperism, the administration of justice, the police, and other expensive charges. Still, further, there was a mass of mental unsoundness, moral disorder, and social tumult. Looking yet further ahead, reading the future from the experience of past and present, there could be discerned an enormous increase in the next and succeeding generations of mental impairment, defective control, paralysed will, and degraded *morale* from inherited braiu degeneration through the poisonous influence of alcohol on parental organ and tissue.

All this mischief was avoidable. How could it be remedied? The remedial process would require time, extending over several generations, but the evil could be remedied. How could this be done?

I.—By recognising inebriety (or, as Dr. Kerr had ventured to call it, "narcomania," a mania for intoxication or torpor) as a disease, and drunkenness as very often but an effect or symptom of disease. They might preach and pray, they might administer teetotal pledges (as the good and single-hearted Father Mathew had done) by the million, but there were vast multitudes of drunkards whose inhibitory power had been so paralysed that they could not resist violating their pledge if liquor was to be had for love, money, or even life. Such persons were as truly under the domination of a disease as if they were the subjects of neuralgia or epilepsy. A fair proportion of such cases, as the experience of the Dalrymple Home for the treatment of inebriety and other similar hospitals proved, could be cured. In the Dalrymple Home, though the previous average term of alcohol addiction had been nine years, more than one-third of the cases had afterwards done well. Even in private practice, without the seclusion of the patient, he had been successful with nearly 20 per cent., though he had a patient as old as 86. Were this disease recognised and treated at an early stage of the malady, Dr. Kerr had no doubt that the majority would be cured.

The present method of dealing with the inebriate was as unfair as it had proved useless. Penal discipline had been a failure. One female

inebriate, aged 35, had been imprisoned 700 times; another had been in prison 52 times in the course of one year. The present method was unfair, because there were many inebriates who from their morbid state could not possibly refrain from drunkenness when at liberty, or resist the abounding temptations to drinking which the Legislature surrounded them with. In fact the Legislature made and kept them inebriates, and punished them, even with death, if they, without criminal design or actually unconscious of the act, committed a criminal offence either in an intoxicated or post-intoxicated state. Our present judicial process simply rewarded the shattered drunkard with the healthful conditions of one of Her Majesty's teetotal club-houses for inebriates, and rehabilitated them for renewing, with re-awakened vigour, their former intemperate career.

II.—By amended legislation (the existing Inebriates' Acts applying only to well-off inebriates voluntarily asking to be admitted to a licensed retreat, under the forbidding requirement of appearance before two justices) to provide for (*a*) compulsory reception and retention of inebriates too demoralised to apply of their own accord; (*b*) for reception of voluntary applicants on a simple agreement, without appearance before justices; (*c*) for the care and treatment of the poor and those of limited means. It would be well also for guardians to have power to pay for the care and treatment of pauper inebriates, and the authorities to establish special hospitals for the detention and treatment of inebriates convicted of crime. Our criminal jurisprudence should be improved so that the most destitute could have the benefit of expert medical testimony in trials complicated with inebriety.

The adoption of such urgently called for measures in the interests of the individual, of the community, and of the administration of justice, though of vital importance, touched but the fringe of the subject. For the prevention of alcoholism in the future, a knowledge of the poisonous action of alcohol on body and on brain ought to form an integral part of education. Immunity from the physical, mental, moral, and social ravages wrought by alcoholism could be eventually secured only by general abstention from even the "limited" use of intoxicants; their exclusion from social, political, and sacred functions; and the scheduling of alcoholic beverages as a *poison* under the Pharmacy Acts, or, by some other legislative enactment, the prohibition of their manufacture and common sale.

Professor Kinkead (Galway) said:—The great obstacle to the practical prevention of inebriety is the conviction which almost universally existed, and which still widely prevails, that inebriety is a voluntary act, a purely moral offence. States have tried to legislate for morals, but such legislation has left a record of deplorable tyranny and failure. Hence the want of success of the laws which deal with drunkenness and their inadequacy to meet the urgency of the case. Drunkenness is no offence; unless drunk and incapable, or drunk and disorderly in some public place, the drunkard can neither be fined nor imprisoned. Although when drunk the individual is insane, yet for crimes committed while so insane he is held equally liable with the sane criminal, on the grounds that his insanity has been produced voluntarily. A source of weakness in temperance efforts is that they are mainly based on this voluntary belief. Inebriates are implored to abstain, exhorted to take a pledge to permanently refrain, in the face of constantly recurring temptation.

Now, if it be true, and the weight of evidence which proves it to be true is to my mind conclusive, that alcoholism is a disease, in which,

whether inherited or acquired, a morbid demand for a narcotic stimulant is developed, then abstinence is impossible during the duration of the morbid condition—possible, perhaps, before the disease is fully developed—but in most cases involving a struggle so severe and prolonged as to be practically impossible. My own experience leads me to place little reliance on pledges in those cases in which they should be most necessary; and as a pledge once broken leaves the sufferer in an infinitely worse moral position, I shrink from their use. Total abstinence, however, is absolutely essential when alcoholism is established, when the neurotic disability leading to inebriety exists, and in the cases of children and young persons.

When we consider the impressionability of the brain of a child, that the nerve centres grow to the mode in which they are exercised, and how imperious habit becomes when once established, more especially when acquired in youth, the danger of creating in the healthy and of developing in those predisposed the diseased condition of inebriety is so great, that the law ought to intervene. It ought to be made an offence to administer to or allow any intoxicating liquor to be taken by any young person except under medical direction.

It may be urged that this would be an unjustifiable interference with parental control, but the law already, in no more urgent cases, interferes with and removes children from the control of their parents. Moreover, a parent has no right to produce or permit to be produced a destructive disease in his offspring, more especially one, the effects of which are not confined to the individual, but transmitted by him to his children.

Punishment has no prohibitive effect. At the International Prisons' Congress of 1871 it was stated that not one in 1,000 persons committed to prison for inebriety ever recovered.

Before a Committee of the House of Lords it was testified by men of the largest experience that they had never heard of a case of a reformation of inebriates from punishment by fine and imprisonment. With this my 12 years' experience as a prison surgeon entirely agrees, and I am convinced that so far from imprisonment preventing drunkenness it does the inebriate actual injury.

Nor can much be expected from more stringent licensing laws, local option, or total prohibition. It is right that public-houses should be regulated, and the sale of drink restricted; but depend on it that as long as the demand exists there will be the supply to meet it, and if the open and legitimate sale be prevented, alcohol will be sold surreptitiously and the evil intensified.

It is absolutely impossible to keep alcohol from those desirous of having it, but it is perfectly possible to keep the individual from alcohol. It passes the power of man to prevent the alcoholic maniac from obtaining stimulants so long as he is at large. It is evident that the common sense remedy is to place him in an asylum, not indeed as a punishment, but to prevent injury to others, and because alcoholism must primarily be treated as a medical question, or rather the moral and legal treatment must be accomplished through the channel of physical cure, as an antecedent and essential requisite. So essential do I deem the seclusion of inebriates, so great is the cruelty to themselves and others of allowing them to be at large until ruin supervenes or crime is committed, that I hold that those having the care of an habitual drunkard should not only be permitted but should be compelled to place him in a retreat.

The injury done by inebriates is vastly greater than that inflicted by lunatics, and the damage and cost to the State enormous. Over a million and a quarter dollars loss, says Dugdale in his history of "The Joker," in 75 years was caused by a single family, without reckoning the cash paid for whiskey, or taking into account the entailment of pauperism and crime of the survivors in succeeding generations, and the incurable disease, idiocy, and insanity growing out of the debauchery and reaching further than we can calculate.

It is getting time to ask—Do our courts, our laws, our workhouses, and our prisons deal with this question, to prohibit the administration of alcohol to the young, and to establish asylums for the treatment and cure of inebriates, and to give power to place the victims of alcohol therein. While for the established disease seclusion from alcohol and treatment is the more hopeful remedy, it is of even greater importance to prevent alcoholism supervening, to prevent, if possible, the neurotic conditions predisposing to its being acquired, to counteract it when inherited.

To effect this most desirable consummation, all that is comprised in the term hygiene is all important, and along with all that can promote health of body and physical development, there should be education of the best sort, and mental training teaching self-control and self-denial.

It seems to me that the practical field for temperance work should be to impress on the public mind that alcoholism is a disease; that for children, for those with a neurotic constitution, for those suffering from overwork, nerve exhaustion, defective nutrition, over-prolonged or too frequent emotional excitement, alcohol is a deadly poison—and so convince it, and through it the Legislature, that in addition to voluntary efforts to induce persons to abstain, legislation is urgently needed, not merely to control the sale of drink, but to prohibit its administration to the young, to establish retreats, and to give power to place the victims of alcohol therein so that they may be cured.

Dr. Isambard Owen (Honorary Secretary of the Section) took part in the discussion solely to correct, by no means for the first time, the numerous misquotations current of the "Collective Investigation Report on Intemperance" of the British Medical Association, of which report he was the author. A certain table of figures contained in the report had attracted the eye of newspaper paragraphists, and had been quoted and re-quoted apart from its context in such a manner as to lead the public to believe that, in the view of the author of the report, the longevity of abstainers fell below the longevity, not only of moderate drinkers, but even of the decidedly intemperate.

He took the opportunity of saying once more: That no such conclusion was contained in the report, that no such conclusion was deducible from the figures in question, and that this was plainly stated in the text of the report. The conclusions of the report, as far as concerned the general health of the public, were the following:—*Summary*: "On the "whole, then, in addition to the information that we obtain from these "returns as to the alcoholic habits of the inhabitants of this country, "and as to the relative alcoholic habits of different occupations and "classes, we may not unfairly claim to have placed upon a basis of "fact the following conclusions:—

"1. That habitual indulgence in alcoholic liquors beyond the most "moderate amounts has a distinct tendency to shorten life, the average "shortening being roughly proportional to the degree of indulgence.

"2. That of men who have passed the age of 25, the strictly temperate, "on the average, live at least 10 years longer than those who become "decidedly intemperate. (We have not in these returns the means of "coming to any conclusion as to the relative duration of life of total "abstainers and habitual temperate drinkers of alcoholic liquors.) "3. That in the production of cirrhosis and gout alcoholic excess plays "the very marked part which it has long been recognised as doing; and "that there is no other disease anything like so distinctly traceable to "the effects of alcoholic liquors. 4. That cirrhosis and gout apart, the "effect of alcoholic liquors is rather to predispose the body towards the "attacks of disease generally than to induce any special pathological "lesion."

As far as his personal experience as a physician went, Dr. Owen felt bound to say that, putting aside the subjects of actual disease, he had never seen either man or woman appreciably the worse for being a total abstainer.

Sir Vincent Barrington, L.C.C., said:—As member of the London County Council Asylum Committee, it may interest you to hear the result of our experience of habitual drunkards. In allusion to duration of life, it has been said that, from a pecuniary point of view, the life of the habitual drunkard is as much too long from a *ratepayer's* point of view as it is too short from that of a *publican.* Over one-half of cases discharged as recovered from our asylums came in with a distinct alcoholic history. A considerable proportion of these immediately revert to old habits, and repeatedly turn up again at one or other of our asylums.

It is asked, "Why not try seclusion?" The law will not allow it. We must discharge every case when once pronounced as no longer lunatic.

As regards the idiot children admitted to our Metropolitan Asylum Board schools, in the groups of "causes" we find a larger number are grouped under the head of "alcoholic history of parents" than in any other group.

I am a believer in the "Norwegian" system, which has transformed what was 40 years ago one of the most drunken countries into one of the most sober. Each "ampt," or county, in Norway can grant monopolies to certain companies for the sale of alcoholic liquors under severe restrictions as to quality, places of sale, and character of employés. The average profits are 15 to 20 per cent., of which 5 per cent. goes to shareholders, and the rest to works and societies for the moral and physical improvement of the people of the country. Some of the large temperance societies in Norway are supported by profits of alcoholic trading, like the serpent swallowing its tail. It is almost impossible to hope to introduce the Norwegian system in England, as it is opposed by the whole temperance party, unfortunately, I think, in the cause of temperance. We must trust to education and good sense, improvement of homes, and means of wholesome recreation for the working classes, enforcement of law against sale of these poisonous compounds bringing misery and ruin to so many homes.

Dr. Robinson (Maine, U.S.A.) said:—The Maine law may seem to be a failure to those living outside of Maine, but no one can live there and look at the matter carefully without being convinced that it is enforced with a good deal of success. The facts are these. In the smaller towns no liquor for common drinking can be obtained. Not only is the law enforced by the officers, but it is backed up by a public sentiment of which an outsider can have no idea. In the larger towns and cities the

enforcement is naturally not so good. Large foreign elements in the population—mostly French and Irish—have no sympathy with the law, and seek every means of evading it. Back-alley selling and "bottle" selling, that is selling from a bottle carried upon the person, is more or less frequent. It depends upon the officers as to how much of this is done. There never was a time in the history of the law when it was as well enforced as to-day. When I left home in July the law was so well enforced in the city of Portland, the largest city of Maine, that by the confession of all it was almost impossible to buy intoxicating liquor.

Dr. Arthur (London) held that the view advanced by Sir Dyce Duckworth that alcohol was a food was rendered untenable by modern research. He thought scientific men were coming more and more to the belief that alcohol was an irritant poison. If this were so it should be widely known. There should be proper instruction in schools of the physiological effects of alcohol. If the State also held this idea of the noxious qualities of alcohol it was its duty to at least attempt to introduce some form of partial or total prohibition.

Dr. Sonsino (Pisa) remarked on the absence of the need of alcoholic liquors in healthy conditions, the superior efficacy of alcohol in illness in subjects who were habitual abstainers, and on the undesirability of giving alcohol to children.

Professor Victor Böhmert (Dresden) called the attention of the meeting to the excellent report of the International Congress of Christiania against drunkenness, and of the intentions of the German Government to prepare a law to prevent the evils of alcohol—Worin eine Beschränkung der Wirthshauser, und eine Entmundigung der Trinker eingefuhrt werden soll. Unsere heutigen Verhandlungen haben gezeigt, dass etwa die Principienfrage: ob total abstinence or temperance vorzuziehen sei, die Verhandlungen beherrscht wie in Christiania.

He would say: It is necessary that total abstainers and temperance men unite, that abstention complete et abstention partielle, as Professor Aglave of Paris puts it, should combine their efforts.

It is better to prevent than to cure. It is necessary that all the various powers of our political and social life, State government, legislation, church, school, friendly societies, single men and women, unite their efforts to reform our laws and customs, and to reinforce the intellectual and moral reaction against the ills of alcohol.

On the Improved Hygienic Condition of Maternity Hospitals.

BY

W. O. Priestley, M.D., LL.D.

In the life of Madame de Staël, by Lady Blennerhasset, it is stated that when Madame Necker first came to Paris "the capital, priding " itself on every refinement of luxury, sufferers in hospital were not " even given separate beds, but as they arrived were added to the ranks, " and indifferently shared a bed with those on the road to recovery and " those who were dangerously ill, the poorly or the dying, a patient

"with an infectious disease, or another merely temporarily indisposed. "The most frightful scenes and fatal results were the daily consequence "of this state of things in the dreadful refuges provided for earthly "suffering. The unfortunate human race was sacrificed under the "very eyes of the nurses and doctors in a way that happily is now "unknown." The period referred to was about 1770, and such a state of things has long since passed away in general hospitals as the result of enlightenment in hygienic arrangements.

Of the maternity hospitals we have no very accurate records for about the same period. The British Lying-In Hospital was instituted in 1749, and the General Lying-In Hospital, in York Road, was founded in 1765. Statistics were, however, not then so accurately compiled as in later days, but there is no reason to think the maternity hospitals were better managed than the general ones, nor the English better than the French.

If we look at the bills of mortality for the whole of London as far back as 1680, we find that for the 20 years ending at that date the average number of deaths in child-birth in London was 1 in 44, and then as the result of greater care and better instruction in the obstetric art, the mortality gradually fell until for the 20 years ending 1820 the average mortality sank to 1 in 107.

Looking at such records as are in existence of the mortality in maternity hospitals in the British Isles and abroad, we see a great diversity of results, not only in different hospitals, but in the same hospitals at different periods. Thus, in the Dublin Hospital, the average mortality of parturition and its consequences from 1757 to 1832 was 1 in 93; in the maternity of Paris from 1799 to 1819 the mortality was 1 in 19. In the best year there, 1802, the mortality was only 1 in 115; in the worst year, 1819, it was as high as 1 in 8 women delivered. The statistics of the maternity hospitals in Vienna, Wurtemburg, and Prussia, give approximately like results for about the same period; and to us who see in later days how these terrible accounts of deaths in mothers can, in a large measure, be prevented, the figures are truly appalling. Miss Nightingale, who is so well known throughout the world for her sympathy with the sick and suffering, and who has done so much to improve modern nursing, has, in her introductory notes on lying-in institutions, compiled very careful tables from various sources, illustrating not only the number of maternal deaths in child-birth in hospitals, but showing also the causes of death from various complications surrounding the puerperal state, and she has contrasted these with the mortality among women under like circumstances confined at their own homes.

Taking Le Fort's well known data from various countries and climates scattered over nearly the whole of Europe, and extending over a considerable number of years, out of 888,312 deliveries she found there were no fewer than 30,394 deaths, giving an average death rate of about 34 per 1,000. In contrast to this the Registrar-General stated the average mortality in England at the time she wrote as only 5·1 per 1,000. Le Fort, indeed, computed the maternal mortality, when women were treated at their homes in this country and on the continent of

Europe at only 4·7 per 1,000. The late Dr. Matthews Duncan, it is true, took exception to both these statements and believed the maternal deaths in home practice were not far short of 8 per 1,000, or 1 in 125, and the Registrar-General, who at the time demurred to Dr. Duncan's estimate, eventually admitted that it was nearer the truth than the lower estimate of M. Le Fort.

But taking the higher estimate even of Dr. Duncan, the fact remained that the mortality to mothers was lamentably higher when they were confined in maternity hospitals instead of at their own homes. Proceeding on the data of M. Le Fort it was nearly 7½ times higher; and even on the calculation of Dr. M. Duncan it was so considerably increased that it became essential to institute a searching inquiry into the causes of the greater danger accruing to the parturient woman when she entered a maternity hospital. This inquiry was taken up by a series of independent investigators, and it soon became abundantly clear that the larger mortality of lying-in hospitals, although to a small extent due to the more serious cases applying for admission to hospitals, was, in fact, chiefly produced by the disease called puerperal fever taking a diversity of forms which specially attached itself to these institutions and led to such disastrous results. No wonder that Miss Nightingale in her zeal for the welfare of poor patients should ask, "Unless it can "be clearly shown that these enormous death rates can be abated, or "that they are altogether inevitable, does not the whole evidence with "regard to special lying-in hospitals but lead to one conclusion, viz., that "they should be closed?"

Investigation proved that this dire scourge called puerperal fever originated in a variety of causes. In the first place it was shown that the mere aggregation of parturient women was, in the special condition of their bodies, a source of danger. Although parturition is a physiological and normal process, there is in lying-in women a special aptitude or proclivity to take febrile affections, and to develop them in intense forms. If then by chance fever gained entrance to the maternity hospital, it found a fertile soil for its rapid development, and spread the more readily from one patient to another because of their proximity. Thus, at least, 75 per cent. of all the deaths in child-birth were found to be owing to puerperal fever.

The first important fact established was that it might be conveyed from patient to patient by medical men, midwives, and nurses. The infectiousness of puerperal fever was long combated and resisted, until the evidence, often repeated and proved to the hilt, left no doubt on this point in any reasonable mind. That charming poet and professor, Oliver Wendell Holmes, exercised a very large influence in combating the scepticism on this point, and in an essay on the contagiousness of puerperal fever, published in 1843, rose to eloquence which has never been forgotten on the folly of those who cast aside the overwhelming proofs in favour of direct infection, and the responsibility resting on those who disregard them.

The second fact elicited was that the disease could be carried from the post-mortem room and the dissecting room by those who were

conducting anatomical or pathological studies, and at the same time attending midwifery cases. This was clearly pointed out by Semmelweis in the maternity hospital at Vienna in 1846. Semmelweis encountered violent opposition in enunciating his views, as they were thought crotchety and likely to interfere with the training of students in midwifery. Time, however, has abundantly confirmed their accuracy; and has proved besides that not only may the contact with poison, in the minutest quantity brought from the post-portem room, produce disastrous results in the lying-in room, but also that particles conveyed by a medical attendant or nurse from patients suffering with erysipelas, eruptive fevers, and the like, may be the germs of an infection which shall cost the life of a patient. Sir James Simpson, in days when we knew nothing of the influence of bacteria in the production of disease, with the intuition of genius, called attention to the analogies between puerperal and surgical fever, and pointed out that there was a similarity both in the symptoms and morbid lesions, as well as in the anomatical condition of the patient. In both classes of patients there were open surfaces exposed through which a *materies morbi* might be absorbed, and he threw ont the suggestion that the poison in each case might be similar or identical. An unhappy illustration of this view occurred at King's College Hospital, where the Nightingale Lying-in Ward was situated in a general hospital, and the patients were thus exposed to the influences surrounding medical and surgical patients. As the result of this proximity the mortality reached the appalling figure of 1 in 13, and it was deemed right to close the ward.

It was not until the discovery of the importance which micro-organisms play in the production of disease that the full significance of these observations by previous investigators was understood.

A little more than 30 years ago the celebrated M. Pasteur demonstrated that all fermentation is intimately bound up, and indeed dependent on the growth of minute cells or organisms which must gain access before fermentation can occur. Schwann had previously discovered that alcoholic fermentation was due to the growth of minute cells which constitute the yeast plant, but we owe to the genius of Pasteur the full development and significance of this discovery and its extension to diseases occurring in men and animals. The investigations of Davaine, Rindfleisch, Waldeyer, Pasteur, Koch, and a host of observers soon established the fact that micro-organisms played a most important part in infective diseases of wounds, and also in various other febrile diseases and pestilences, the causes of which had been shrouded in mystery. Then followed the striking results of the antiseptic treatment, initiated by our illustrious countryman Sir Joseph Lister, founded on the recognition of the parasitic character of the infection which poisoned wounds and produced suppurative processes. These let in a flood of light not only on the unfortunate results of many surgical accidents and operations, but eventually opened the eyes of obstetricians as to the probable nature of puerperal fever, and the possible conveyance of a *materies morbi* from some external source to

the body of the puerperal patient. Experiments and observations demonstrated that the germs of infections diseases were so minute and so subtle, that they might be carried in the atmosphere we breathe, on the hands of the doctor or the nurse, or in the clothes of either; and if unfortunately the smallest quantity of the organic poison got access to an absorbent surface of a susceptible patient, it multiplied so rapidly as to pervade the whole system in an incredibly short space of time. In illustration of the subtilty of this process, I may point out that a sterilized fluid may be kept an indefinite time without change when atmospheric air and all extraneous sources of contamination are excluded, but let the daintiest finger touch the surface of the fluid, and it instantly begins to develop microbes, the germs of which have been communicated by the finger. This illustrates the extreme subtility of microscope life. To produce specific effects there must, of course, be specific germs.

So far as I can make out, it was Professor Stadtfelt of Copenhagen who first applied the antiseptic method to puerperal uses in the Copenhagen Maternity Hospital. Here carbolic acid, believed to be a potent germicide, was employed not only in the form of lotions, to the mucous and cutaneous surfaces of the patient, which were the obvious points of infection, but the hands of the medical man, midwife, and attendant, as well as every instrument employed, were sterilized by the same material, Later M. Tarnier, in Paris, introduced bichloride of mercury or corrosive sublimate for the same purpose as being a more efficient germicide, and free from some of the objections attaching to carbolic acid. This is now extensively, I had almost said universally, adopted as the most trustworthy agent for the purpose required, and it is used in solutions varying from 1 in 1,000 to 1 in 4,000, according to the uses to which it is put.

Eventually it came to be acknowledged that the poison of puerperal fever and its congeners did not originate under any circumstances in the body of a patient, that there was no such thing indeed as "auto-infection," but that in all instances the infection must be imported to the patient from without. Guided, therefore, by the progress of antiseptic surgery, Winckel, Breisky, Schroeder, and Gusserow, in Germany, inaugurated a new departure, and began the practice of *aseptic* as contradistinguished from *antiseptic* midwifery. The principle of asepsis is to guard absolutely against the introduction of any poisonous matter from without, not to destroy it when already present. With this view certain methods of antiseptic treatment applicable to the person of the maternity patient, which had been found by experience to be followed by inconvenience and even danger, were discontinued or reserved only for particular cases. Instead, the strictest precautions were taken to render aseptic every single thing which might possibly convey infectious particles to the patient. Not only were the drainage ventilation and drinking water carefully looked into, but the hands of the medical men, students, and nurses, were rendered thoroughly aseptic by immersion in a solution of corrosive sublimate or other germ

destroyer. Every instrument employed was treated in the same manner, and the clothing of all the attendants was either purified or covered over completely with some protective envelope.

Evidence in proof of the value of asepsis as contradistinguished from antiseptic treatment is furnished by the results obtained in the maternity hospital at Helsingfors, in Finland. There the hospital is built upon a rock well above the level of the town and overlooking the Baltic with its wonderful fortifications. The purity of the atmosphere is promoted therefore by its natural situation. The foundations are dry and clean. The buildings are well-drained, and as they overlook the sea, they are constantly bathed by the sea breezes. With these advantages it has been found that antiseptic precautions will suffice to prevent disaster less rigorous than in more crowded localities, where the atmosphere is less pure, and other chances of contamination greater. The Finlanders are personally a very cleanly people, even the poor bathing frequently, and giving much attention to keep the skin clean and in good order. With these favourable conditions to start with and the comparative isolation of the place, Professor Pippingsköld informed me that he did not find it necessary to disturb his patients by a slavish adherence to the minute antiseptic precautions practised elsewhere. In view nevertheless of the remarkable success which had been attained in other countries, he considered it necessary so to guard his patients, that no germs of disease could be imported from a foreign source, and consequently all doctors, nurses, and instruments were rendered entirely aseptic before coming in contact with the patients. At no time does the Helsingfors Maternity Hospital seem to have been decimated by puerperal fever as in other countries, yet under the new aseptic system there were good and instructive results. Not only has the *mortality* been lessened, but the *morbidity* or amount of illness incident to the puerperal state has been diminished. Thus, under the old régime, the deaths from puerperal fever were not more than 1·26 per cent. Under the new, the mortality out of 3,482 deliveries were only 0·60 per cent., and it was thus calculated that the lives of 22 mothers had been saved by the precautions of the later period.

TABLE 1.

Mortality from Puerperal Fever in the Helsingfors Maternity Hospital (Pippingsköld).

In the Old Hospital.

1859 to 1869	7 per cent.
1870 „ 1871	4 „
1872 „ 1877	1·11 „

In the New Hospital.

1879 to 1883	0·70 per cent.
1884 „ 1887	0·29 „

The *morbidity* before aseptic precautions were adopted was 12·10 per cent. Under the aseptic régime it sunk to 4·11 per cent.

In 1885 I made a tour of some of the lying-in hospitals of Northern Europe, and had the opportunity of witnessing what had been done by the recognition of the way in which, according to modern scientific ideas, fever was introduced into maternity hospitals, and of the methods adopted to insure immunity. In Copenhagen, the cradle so to speak of antiseptic midwifery, the improvement in the salubrity of the maternity hospital was well marked and kept pace progressively with the stricter antiseptic precautions gradually developed and enforced by the administration. The maternity hospital at Copenhagen is an old building, with many of the disadvantages which are obviated in those of more recent construction, but Professor Stadtfelt, impressed with the idea, as he puts it, that "the hygiene of a maternity hospital depends less upon its con- " struction and upon its age, than upon the hygienic principles upon which " it is directed, and on the perseverance with which these principles are " carried out in the daily service," determined, in 1865, to adopt an antiseptic method of treating puerperal patients, similar to that introduced by Sir Joseph Lister in surgical patients.

Previous to 1865 the mortality from puerperal fever in the Copenhagen maternity hospital had been very high, as elsewhere. During the 15 years from 1850 to 1864 it was as high as 1 in 24 women delivered; the average mortality from the same cause being about 1 in 123 in the town of Copenhagen itself, exclusive of the hospital. Earlier than this the mortality had been even higher, for, from the statistics of Dr. C. J. Kayer, the deaths between 1822 and 1843, with 21,149 deliveries, had actually amounted as high as 1 in 19. Immediately after the institution of the antiseptic system in 1865, the mortality from puerperal fever began to decline. From 1865 to 1874 the deaths were reduced to 1 in 51 of the deliveries, and in the last four of these years, viz., from 1870 to 1874, the mortality was reduced to 1 in 87. I have no later statistics from Copenhagen, but have heard that the improvement has been progressive and has kept pace with the advance of knowledge in the prevention of childbed fever.

A mode of disinfecting nurses who had perchance been attending a puerperal patient affected by illness in Copenhagen, seemed to afford considerable amusement to those who heard the details, and were not themselves the subjects of the experiment. The nurse or midwife, after her nursing was over, was fumigated with sulphurous acid vapour. For this fumigation a room was set apart in which the vapour was generated, and the whole of the body and clothing of the nurse were fumegated except the head. As sulphurous acid gas is absolutely irrespirable, and even in small quantities is extremely distressing to the air passages, it is necessary to protect the mouth and nose from its effects. The head was, therefore, excluded from the vapour by an elastic india-rubber tube, which surrounded the neck at one end, and admitted air at the other from a corresponding aperture in the window. This was regarded as one of the most effectual methods of personal disinfection, but was, I learned, not very popular among the nurses, as however carefully arranged it is scarcely possible to prevent the sulphur fumes from getting access to the breathing passages, and a quarter of an hour's

detention in this "durance vile" was not regarded as an agreeable experience.

In Russia, the antiseptic or aseptic methods have been adopted with remarkable success. The maternity hospital in St. Petersburg, which is humanely supported by the Grand Duchess Catherine, a cousin of the present Czar, is one of the most carefully regulated in the world. It is under the personal supervision of Professor Balandin, and when I visited it in 1876 I was much struck with the completeness of the details for isolating the patients from all adverse influences. The discipline imposed upon everyone, from the physicians to the least important domestic, reminded one of the regulations in a prison. No one is allowed to approach the wards occupied by the lying-in patients, except with the most rigid precautions to exclude infection, and the keys of communication were only permitted to the heads of departments. Throughout the whole hospital the most scrupulous cleanliness was observable: every utensil, every instrument, every article of clothing, down to the woollen socks lent to patients, were rendered aseptic and kept so. As soon as any occupied room was vacated, it was at once stripped and subjected to a cleansing and disinfecting process. The floors were laid with a mosaic concrete, and the walls half way up were of tiles, the res being parian cement. Both floor and walls could thus be thoroughly washed with an antiseptic solution, and jets and taps of water were skilfully arranged for this purpose.

As the result of this careful management, I learned that during the previous three years there had been only one death from puerperal fever in the whole establishment, and this was in the case of a woman who was brought ill to the hospital and died three days after the birth of her child. There had been six deaths in the same period from unavoidable causes other than infectious disorder. The *morbidity*, too, had steadily declined since the introduction of the antiseptic system. These results are the more remarkable as in the city of St. Petersburg itself outside the hospital, both general and puerperal mortality are very large.

And what I have said of the improved hygienic conditions of the Grand Duchess Catherine's hospital in St. Petersburg holds good for the other maternity hospitals in Russia. Professor Slawiansky, at the International Medical Congress in Berlin last year, gave the statistics of no less than 52 such institutions in Russia, and conclusively showed that just in proportion as antisepsis had been rigidly enforced, so had both puerperal illness and puerperal mortality declined. In the tables furnished he does not give the figures previous to the introduction of antisepsis, but the following table is both interesting and instructive, and in marked contrast to the figures of Le Fort, viz., 34 per 1,000, being only 0·38 per cent.

TABLE 2.

Statistics of Russian Maternities. (Slawiansky.)

Year.	No. of Cases.	Puerperal. No.	Illness. Per cent.	Puerperal. No.	Deaths. Per cent.
1886 -	17,193	1,583	9·43	82	0·48
1887 -	18,405	1,803	10·04	82	0·44
1888 -	19,763	1,562	8·18	66	0·33
1889 -	21,280	1,415	6·90	60	0·28
Total -	76,646	6,363	8·57	290	0·38

The statistics of the lying-in hospitals of Vienna, Dresden, Paris, New York, and Boston, show a like improvement in the hygienic conditions since the introduction of an aseptic or antiseptic method. There is necessarily some variation, probably arising from the difficulty of enforcing the same rigid precautions in some hospitals as compared with others, but even in the Paris maternities, the records of which seem somewhat less favourable than in Vienna, for example, the results of the new régime are very striking.

The following tables have been kindly furnished to me by Dr. Cullingworth, of St. Thomas's Hospital, and were used by him to illustrate a paper on "puerperal fever, a preventible disease," a year or two ago.

TABLE 3.

Imperial Lying-in Hospital, Vienna.

Date.	Deliveries.	Deaths.	Mortality per 1,000.
1857–62 - -	25,123	722	28
1863–80 - -	68,770	1,117	16
1881–85 - -	15,070	106	7

Mortality from Puerperal Fever.

Date.	Rate per 1,000.
1863–80 -	13
1881–85 -	4

TABLE 4.

Dresden. (Leopold.)

Date.	Deliveries.	Deaths from Puerperal Fever originating in the Hospital.	Mortality per 1,000 from Puerperal Fever.
1883 - -	1,368	12	8·7
1885 - -	1,365	2	1·4
1886 - -	1,387	2	1·4
1887 - -	1,388	1	0·7

TABLE 5.

Paris Maternité. (Tarnier.)

Date.	Mortality per 1,000.
1858–69 - -	93 = 1 in $10\frac{3}{4}$
1870–81 -	23 = 1 in 43
1882–8 - -	11 = 1 in 91

TABLE 6.

New York Maternity Hospital.

Year ending	Deliveries.	Total No. of Deaths.	Deaths from Sepsis.	Mortality per 1,000 from Sepsis.
Sept. 1883 -	429	34	26	60·6
Sept. 1884 -	505	7	3	5·9
Sept. 1885 -	541	4	1	1·8
Sept. 1886 -	463	4	1	2·1

TABLE 7.

Boston Lying-in Hospital.

Date.	Deliveries.	Total No. of Deaths.	Depths from Sepsis.	Mortality per 1,000 from Sepsis.
1882 - -	288	17	16	55·5
1883 - -	242	14	11	45·8
1884 - -	310	6	5	16·1
1885 - -	308	4	2	6·4
1886 - -	373	3	—	—

There are one or two points in connexion with these tables which deserve comment; and while they illustrate the importance of pure air and heathful surroundings in preventing illness and in promoting the recovery of puerperal patients, they at the same time emphasize the good which has been done by the adoption of aseptic or antiseptic precautions.

Thus it should be noted in the case of the Vienna Hospital there was a distinct improvement in the salubrity of the institutions between 1863 and 1880. Previous to this the mortality was 28 per 1,000. Then it was 13 per 1,000. This improvement took place merely as the result of reconstructing the ventilating and heating arrangements, and of better management generally. Then came the introduction of antiseptics, and the mortality sank to less than half, the deaths from puerperal fever being only 4 per 1,000. Especially should it be remarked that in all large maternity hospitals there is always a considerable percentage of difficult and dangerous cases, many of them calling for operative interference. These are necessarily more prone to febrile affections than natural cases, and a recollection of this fact makes the figures more striking. When it is added that in the Vienna Hospital there were no less than 7,964 students instructed in the art of obstetrics during the 29 years in question, the results appear the more marvellous, inasmuch as students have so commonly been regarded as the bearers of infection from one bad case to another.

Again I may recall the fact that the advantage of the improvements introduced into maternity hospitals does not end in the reduction in the number of deaths. Professor Leopold has shown that in the Dresden Hospital the perfectly normal recoveries in 1886 were 77·8 per cent.; in 1887 95 per cent. In other words 95 per cent. of all the women recovered without a bad symptom, the temperature in no case rising higher than 100·4°.

Great Britain was somewhat slower than continental countries to introduce the antiseptic method into its maternity hospitals, but the results have not been less satisfactory. Up to 1877 the General Lying-in Hospital in York Road was scarcely ever free from puerperal fever. Great anxiety was constantly occasioned by repeated outbreaks of the disease, and the institution had frequently to be closed for disinfection. Great expenses were incurred to improve the drainage and other sanitary conditions, but not until the introduction of antisepsis was anything like safety attained. The year 1879 was the turning point. Since then as the result of the new method, and a larger knowledge of the precise details to ensure its efficiency, the total mortality—which from 1833 to 1860 averaged 30·8 per 1,000, and from 1861 to 1877, 17 per 1,000—has since fallen to 6 per 1,000, and puerperal fever has been so nearly abolished that there was only one death from it in three years. At the same time it has become an unusual event for a patient's temperature to rise during convalescence above 100°.

A like success has attended the introduction of a careful antiseptic method into other maternity hospitals in this country; and so much is it now relied upon, if efficiently carried out, that there is perhaps the

danger of other sanitary conditions being regarded as of too little importance. There is at least this security that by general acknowledgment, a thoroughly antiseptic plan is greatly facilitated by other sanitary arrangements, such as ventilation and efficient drainage.

The fact must not be lost sight of that although the remarkable diminution of mortality and of ailments incident to the puerperal state is probably mainly due to the introduction of antiseptics, yet other factors have also played an important part in producing these good results. Thus improvements in the construction of maternity hospitals, in the larger amount of cubic space allotted to each patient, in the arrangements for drainage, ventilation, and water supply, and lastly, and not least, the greater knowledge and intelligence exercised in nursing—all have conduced to the welfare of puerperal patients.

My friend, Mr. Bostock, who since his retirement from the Army has unceasingly devoted himself to philanthropic work, and besides being a member of the Metropolitan Asylums Board is also a member of the Kensington Vestry, consulted me, two or three years ago, concerning the erection of a lying-in hospital for his parish. As the result of his initiative a new lying-in infirmary has been built with the improvements which modern science has suggested. It is on the pavilion system, each of the two pavilions or wards containing 10 beds, and these are widely separated from each other, the administrative block being situated between them and communicating by an open but covered corridor. When all the beds in one ward have been occupied, the ward is closely sealed and fumigated with sulphurous acid, while the other ward is utilised. The alternate system is the essential point in the administration, but besides this the aseptic or antiseptic method is carried out very completely.

The medical superintendent, Mr. Percy Potter, says in his report that as the result of the last two years' experience, he has to accord unqualified praise so far as the effects upon the patients are concerned. There has been an entire absence of puerperal fever and of septic poisoning. Should puerperal fever arise in a single case, there is not one condition by means of which it is likely to spread. The old lying-in wards were part of the general infirmary where cases of every description were treated, including erysipelas, pyæmia, suppuration, and cancer. Consequently there were outbreaks of puerperal fever frequently recurring. Mr. Bostock tells me that he had some difficulty in making the guardians understand that new wards were necessary, and still more to induce them to pay for 20 beds when only 10 were wanted. The experiment has, however, been fully justified by the results.

In concluding this paper, I would briefly call attention to a table in which I have thrown together the statistics of maternal deaths in six lying-in hospitals, situated in various countries, since the introduction of aseptic or antiseptic methods. With these I have contrasted the figures of M. Le Fort before the era of antiseptics, and Mr. Newbatt, the distinguished President of the Statistical Society, has kindly computed for me the difference in the proportion of deaths in the two cases.

TABLE 8.

Mortality in Maternity Hospitals from all Causes in various Countries of Europe. (Le Fort.)

Before the Introduction of Antiseptics.

	Deliveries.	Deaths.	Per 1,000.
Total -	888,312	30,394	34·21

After the Introduction of Antiseptics.

——	Date.	Deliveries.	Deaths.	Deaths which would have occurred on basis of Le Fort's figures.
Vienna - -	1881–5	15,070	106	516
Dresden -	1883–7	5,508	57	188
Russia - -	1886–9	76,646	290	2,622
New York - -	1884–6	1,919	15	66
Boston - ..	1883–6	1,233	27	42
General Lying-in Hospital, London.	1886–9	2,585	16	88
Total -	—	102,961	511 (4·963 per 1,000.)	3,522

Number of Lives saved out of the 102,961 since the Introduction of Antiseptics.

Expected deaths on Le Fort's basis -	-	3,522
Actual deaths - -	-	511
Saving	-	3,011

It will be seen that while, according to M. Le Fort, the maternal deaths in European lying-in hospitals were 34·21 per 1,000 under the old régime, the mortality is now reduced to somewhat less than 5 per 1,000. This computation, put in another way, indicates that if the former rate of mortality had been maintained 3,522 maternal deaths might have been expected; the actual deaths were only 511. In other words, 3,011 lives of mothers were saved as the result of new and purely scientific methods of treatment. This, I think, may fairly be stated to be one of the most striking triumphs of preventive medicine. It is no mean achievement to rescue from death more than 3,000 lives of women in the acme of their maturity, and when their lives are most valuable to their families. It may furnish an instructive study to some opponents of scientific research, who have not hesitated to charge those engaged in experimental investigations, with a desire to gratify their own personal ambitions, rather than to promote the welfare of the community at large.

DISCUSSION.

Dr. Graily Hewitt (London) congratulated the author on his valuable paper. He had formerly acted as physician to the British Lying-in Hospital, and had been much interested in the causation of puerperal fever. His observations had been published in the Obstetrical Transactions. At that time general opinion was against the further spread of lying-in hospitals, owing to the high mortality. Happily matters have now been changed, and the recent improvements have been such that lying-in hospitals can now be carried on with almost absolute safety to the patients, and so as to allow with safety the admission of students for the teaching of midwifery. He mentioned an interesting case where in private practice, diphtheria had apparently been produced in the nurse by cotton wool used in cleansing the patient, which had remained for twenty-four hours forgotten in a drawer. The case illustrated one method in which serious disease might originate.

Mr. Francis Fowke (London) wished to call attention to a source of infection, not only in lying-in hospitals, but in general hospitals and in private life. He had taken great interest in the question of hospital hygiene. Twenty-three years ago he was house governor of a large general hospital, the surgical wards of which had been newly built with every scientific care; the walls were of Parian cement, the floors of polished oak, dry scrubbed, no water being used in the cleansing, but still there were occasional outbreaks of erysipelas, phagedæna, and pyæmia. At this time he had heard of the success of Professor Lister's wards, in which two or three cases in the children's wards were put into one bed to show the advantage of his system, and yet no infection occurred. In going round the hospital one day, he found a bad case in the dead house, with one of the hospital bed sheets over the body. After visiting the laundry he was convinced that this was the source of infection, as the sheets were not properly disinfected. In Professor Lister's cases, the source of infection was cut off, and much of his success was due to this. The speaker felt certain that the laundry was a frequent source of infection, and he had no doubt that the spread of influenza was largely aided by imperfect disinfection of bed clothes and body linen; he believed also, that a similar source might furnish the cause of at least some of those cases of erysipelas, etc., which at present and in default of precise knowledge were classed as of "idiopathic" origin.

Dr. Leduc (Nantes) said:—Comme nous le disait tout à l'heure le docteur Priestley, les résultats obtenus par l'introduction de la méthode antiseptique dans les maternités, démontrent de la façon la plus évidente les avantages de cette méthode, et font ressortir l'importance de la médecine préventive. Mais si l'on considère combien est petite la proportion des enfants qui naissent dans les maternités, comparativement à ceux qui naissent en dehors on se fera une idée de l'importance qu'aurait la diffusion des règles de l'antisepsie dans les familles; il est nécessaire que le Congrès signale quels sont les avantages de l'antisepsie appliquée partout où il y a des malades, et lorsque ces notions seront répandues on verra se multiplier les magnifiques résultats signalés par le Dr. Priestley.

La Prévention de la Cécité professionnelle.

PAR

le Dr. J. C. VAN DOOREMAAL, Med. Ocul. à la Haye.

Chaque pays a les aveugles qu'il mérite.

Au Congrès de la Haye M. le docteur Matthias Roth, l'infatigable apôtre de la prévention de la cécité, fâisait une communication " On the Causes of Blindness."

A ces causes déjà décrites par le docteur Hugo Magnus, dans son beau livre "Die Blindheit, ihre Entstehung und ihre Verhütung", les préjugés, j'ajoutais qui, comme je le démontrais alors, ont fait plus d'aveugles que toutes les autres causes de la cécité ensemble.

J'attirais surtout l'attention sur le fait, que la patrie de Donders avait déjà depuis 1869 moins d'aveugles que les autres pays.

Le docteur Magnus sur la foi de Mayr prétend, que le récensement en Hollande a été très incomplet, et que le petit nombre d'aveugles n'est dû qu'à l'inexactitude avec laquelle le statistique a été faite.

La supposition de Magnus pèche par la base; car le récensement de 1869 a été fait absolument de la même manière que le récensement de 1859 et en 1859 la Hollande avec, ses 2 mille aveugles (1,992) c'est à dire 1 aveugle sur 1,661 habitants, occupait la 7ième place de la liste et n'en tenait pas encore la tête comme en 1869. Et qu'y-a-t-il d'étonnant, dans le fait que l'influence de Donders c'est fait sentir après ces dix années.

Heureusement nous possédons encore d'autres preuves pour démontrer, que le nombre des aveugles a graduellement diminué en Hollande.

De 1865 à 1875 l'Institut des Jeunes Aveugles à Amsterdam a récueilli 54 enfants, dont 17 aveugles par ophthalmie des nouveau-nés; soit 31·48, c'est à dire un peu plus que la proportion actuelle de l'Angleterre.

Entre 1875 et 1890 dans le même Institut ont été recueillis 75 garçons et 44 filles. De ces 119 enfants 24 étaient aveugles par ophthalmia neonatorum, c'est à dire 20 pCt.

Dans ce moment-ci, comme à l'époque du récensement de 1889 l'Institut des Jeunes Aveugles à Amsterdam comptait 41 garçons et 21 filles, dont 9 aveugles par ophthalmie des nouveau-nés, c'est à dire 14½ pCt.

Nous avons donc le droit de supposer, que le nombre des aveugles par ophthalmia neonatorum dans la Hollande n'est que la moitié de ce qu'il est dans les autres pays.

Pénétrée de la haute importance d'une bonne statistique, l'Association néerlandaise pour l'Avancement des Sciences Médicales adressa au Gouvernement la prière de faire compter les aveugles au récensement du 31 Décembre 1889.

Le Gouvernement acquiesca à cette prière et l'énumération des aveugles eut lieu de la même façon qu' en 1859 et 1869. Si de cette manière nous n'avons pas obtenu un résultat idéal, nous aurons au moins des chiffres comparables entre eux.

Je regrette de ne pouvoir vous communiquer les résultats de cette enquête, qui malheureusement n'est pas achévée, et dont nous ne connaissons encore que les chiffres de la province de Zuid-Holland (la Hollande méridionale).

Le nombre des aveugles dans la province de la Hollande-méridionale s'élevait en

1859 à 345	c'est-à-dire	1 aveugle	sur 1,793	habitants.
1869 à 203	”	”	” 3,360	”
1889 à 508	”	”	” 2,321	”

Le nombre des aveugles pour cette province tient donc le milieu entre 1859 et 1869.

L'Association néerlandaise pour l'Avancement des Sciences Médicales ne s'est pas contentée de ce premier succès, mais a prié le Gouvernement de faire une enquête sur les causes de tous les cas de cécité.

S.E. le Ministre de l'Intérieur a décidé, que chaque fois que le récensement d'une province sera terminé, les cartes des aveugles seront remises à la Commission.

Et c'est là où chaque pays doit arriver, car connaître les causes de la cécité, c'est prévenir bien des malheurs.

Je n'ai pas l'intention de passer en revue toutes les causes de la cécité, mais je sollicite votre bienveillante attention pour traiter avec vous de quelques causes de la cécité professionnelle, c'est à dire la cécité causée par le travail.

Mais même encore ce chapitre serait trop étendu pour être traité dans le temps accordé à chaque orateur, et je me bornerai à deux exemples. Je veux démontrer qu'il est possible de prévenir encore bien des cécités causées par le travail, nonseulement dans l'industrie, mais aussi à la campagne. Comme exemple de ce que l'on peut faire dans l'industrie, je me contenterai de vous montrer ce qui a déjà été fait pour prévenir les cas de cécité, causée par les explosions dans la fabrication des eaux gazeuses; pour la campagne, je me bornerai à traiter des ulcères graves de la cornée, dites kératites avec hypopyon.

La cécité professionnelle, qui a depuis le plus long temps attiré l'attention des médecins et des hygiénistes, est la cécité causée par la kératite des moissonneurs.

Au congrès d'Amsterdam, M. le Dr. Georges Martin, de Cognac, fit une conférence sur "La Kératite des Moissonneurs et la Cause de la Fréquence de la malignité de cette affection":—

"La malignité de cette inflammation était encore, il y a peu de temps, entourée d'un certain mystère pour la plupart des praticiens.

"On croyait que l'extrémité terminale de l'épi pénètre entre les lames de la cornée et y dépose un principe toxique spécial.

"Aujourd'hui nous savons que cette hypothèse est un pur produit de l'imagination, et que l'épi dans ses barbes ne possède aucun principe particulier. Aussi voyons-nous souvent la kératite à hypopyon parmi

nos paysans, qui ne cultivent que les pommes de terres, les légumes et les fruits, et quelquefois parmi les ouvriers qui travaillent aux digues. Mais nous savons encore que sur un organe entièrement sain une blessure par des épis est presque sans conséquence. La kératite qui en résulte, (et elle ne survient pas toujours,) guérit rapidement et sans laisser des traees apparentes de son passage.

" Et si chez le plus grand nombre, ees sortes de blessures engendrent un grand danger, e'est que les maladies des voies lacrymales sont très fréquentes ehez les agriculteurs ainsi que chez nos ouvriers des digues, qui vivent à peu près dans les mêmes conditions.

" Le meilieu, dans lequel ils sont journellement placés, en est la cause. Ils vivent en effet exposés à toutes les intempéries des saisons, aux grands vents et poussière, en d'autres termes, ils séjournent pendant toute la durée des travaux dans une atmosphère ennemie. C'est le froid qui les fait pleurer, c'est la terre désséchée (et pour nos travailleurs des digues le sable des dunes et de la plage), qu'ils souèvent avec leurs instruments, et qui vient se loger dans leurs yeux et les irriter ; e'est surtout *la position inclinée* de la tête, qui congestionne ces organes ; c'est, enfin, le manque de soins hygiéniques et de propreté.

" En ophthalmologie, il y a des notions dont la eonnaissance est tout-à-fait inutile à la généralité des médecins ; d'autres faits, au contraire, doivent être généralisés ie plus possible. Et parmi ces faits nous plaçons en première ligne, que l'inflammation des voies lacrymales est causée par l'infection et qu'à la moindre perte de substance de l'épithélium, la plaie de la cornée est infectée par les microbes eontenus dans les secrétions altérées du sac lacrymal."

Il faut que chaque médecin établi dans une contrée agrieole sache soigner une dacryocystite et prévenir l'infection de la plaie cornéenne par un traitement antiseptique rigoureux.

Le traitement trop long, les voyages trop nombreux empêchent le malade d'aller se faire soigner ailleurs. Chaque laboureur atteint de blennorrhée du sac doit trouver un traitement approprié chez lui.

C'est seulement alors que nous verrons disparaître les kératites graves dites des moissonneurs, qui causent à la campagne une cécité de 67 p.Ct., tandis que pour les villes les maladies de la cornée n'entrent dans la statistique de la cécité que pour 8 a 10 p.Ct.

On voit que sur ce terrain, il y a encore beaucoup à faire et qu'aussi à la campagne la prévention de la cécité est bien plus dans la main du médecin ordinaire que dans la main des spécialistes.

Le contraste entre les traumatismes des yeux à la campagne et à la ville dans les fabriques et les ateliers est très instructif.

La majorité des cas de céeité professionnelle à la campagne est causée par un traumatisme insignifiant et une infeetion grave.

A la ville la cécité professionnelle est causée par un traumatisme grave sans, ou à peu près sans, infection.

A la campagne il s'agit donc de prévenir l'infection ; dans l'industie il s'agit de prévenir le traumatisme.

Apprendre au public, qu'un individu ne doit pas vivre tranquille avec une blennorrhée du sac lacrymal et aux médécins qui vont s'établir dans les campagnes, à soigner une dacrocystite et prévenir l'infection de la plaie par un traitement antiseptique rigoureux.

Les traumatismes de l'industrie ne peuvent être enrayés que par le concours des ingénieurs, des fabricants et des médecins.

Les ingénieurs doivent nous aider à construire des machines où toutes les précautions sont prises pour prévenir les accidents.

Les fabricants, contre-maîtres etc. doivent surveiller les fabriques pour s'assurer que les ouvriers ne négligent pas les précautions nécessaires et observent strictement les règlements.

Les médecins doivent s'occuper à perfectionner les moyens qui protégent le corps de l'ouvrier : lunettes protectrices, masques, vêtements, etc.

Les expositions spéciales (Amsterdam 1890) sont un moyen puissant pour nous tenir au courant de ce qui a déjà été fait et de ce qu'il nous reste encore à faire.

On s'est donné bien de la peine pour composer une statistique des industries qui causent le plus grand nombre d'aveugles ; malheursement on n'y pas réussi. Nous savons seulement que quelques industries sont plus mal famées que les autres, p. e. l'industrie textile.

Dans le rapport de la Commission anglaise sur les Aveugles dans le Royaume Uni nous lisons à cet égard :—

"In Lancashire accidents from shuttles flying out of the loom are unfortunately very frequent, and generally are of a very destructive character. Of late years by the introduction of shuttle-guards, something has been done to reduce their frequency. At the Royal Eye Hospital, Manchester, during 1885, they had only nine cases of shuttle-accident, as against 21 the year before. (In 1886 the number of such accident was 11.)"

Que l'on compare l'année 1884 soit avec l'année 1885 (neuf accidents contre vingt-et-un) ou avec l'année 1886 (11 accidents contre 21) on constate qu' un véritable progrès a été réalisé, surtout quand on songe que ces accidents causent d'ordinaire une cécité complète.

Et on ne s'est pas arrêté en si beau chemin. A l'exposition d'Amsterdam pour l'avancement de la salubrité et la securité dans les fabriques, nous étions à même de voir un grand nombre de métiers pourvus de différents arrêts enfin d'empêcher la navette de s'élancer dans l'atelier. Les envois de Mulhausen (Association pour Prévenir les Accidents de Fabrique) et des ingénieurs Tattersal et Holsworth reçurent la médaille d'or.

Une industrie toute ainsi mal famée et sur laquelle l'attention a été attirée par le Dr. Brudenell Carter, est la fabrication des eaux gazeuses.

Nous avons l'intention de nous arrêter à cette industrie, puisque l'Exposition d'Amsterdam nous a montré qu'il est possible de prévenir tous les accidents.

La manière dont on procède est la suivante :—La bouteille à remplir est posée horizontalement et récouvert d'un manteau de fer s'ouvrant par en bas, de sorte que si la bouteille fait explosion, les

morceaux ne peuvent pas s'élancer dans l'atelier mais sont jetés à terre. Le seul desideratum est une fermeture automatique.

Les ouvriers chargés de remplir les bouteilles sont obligés de porter des masques qui non seulement protègent les yeux mais la plus grande partie de la tête. Inutile d'ajouter, que ces masques servent parfois bien plus à orner l'atelier qu'à protéger la tête de l'ouvrier.

Aussi y-a-t-il encore bien des améliorations à apporter dans la construction de ces masques.

Voilà un exemple de ce que nous pouvons attendre du concours des ingénieurs, des fabricants et des médecins.

Puisse chaque nouvelle exposition nous en apporter autant pour une autre industrie.

On the Prevention of the Spread of Epidemic Influenza.

BY

Richard Sisley, M.D.

It is impossible to calculate with accuracy the number of deaths caused by an epidemic of influenza, because (1) during an epidemic many people who already suffer from organic diseases which would ultimately prove fatal die sooner than they otherwise would because they are not strong enough to overcome the depressing effects of influenza in addition to those of the pre-existing disease*; (2) because it is common for diseases of the respiratory organs to follow attacks of influenza, and the maladies thus set up may not end fatally for weeks, months, or even for years.† But although no exact numerical representation of the mortality of influenza can be given, the number of deaths caused by the disease is undoubtedly great, and if anything can be done to prevent the spread of the disorder, the subject is, I think, of sufficient importance to be worthy of the consideration of this Congress.

As a preliminary to the discussion of this question, it is necessary to consider how the disease arises and how it is spread.

I.—How does the disease arise? The origin of the influenza concerns us in England less than the spread of it, for except at Bedford Park, and even so far as that place is concerned on the authority of a single observer,‡ I am not aware that influenza is supposed, by anyone, to be sporadic or endemic in any part of England.

* From this consideration it follows that the increased death rate shown during the height of an epidemic does not accurately represent the mortality due to the disorder: but, as far as that time is concerned, is an exaggeration of it.

† Hence the fatal results of the disease cover a period of time much greater than that occupied by the epidemic.

‡ Dr. Gordon Hogg. British Medical Journal.

In China the disease occurs sporadically, and there is evidence that it is endemic. At Swatow,* for example, sporadic cases of influenza are not uncommon, and in Mongolia† the disease is well known. The epidemic which affected England in 1889–90 apparently originated in Bokhara in the summer of 1889,‡ and came to us after affecting the inhabitants of the intervening countries, Russia, Germany, France. II.—By what means did the disease reach us? How does it spread? Is it contagious? Or is the poison air-borne? Can it be carried by parcels or by letters? These questions have long been discussed, but different answers are still given to them.

Many of the more observant of the older writers were of opinion that direct contagion played a great part in the spread of the malady, and as early as 1743§ this idea was adopted by the Pope, who proclaimed a "land quarantine" to prevent its progress. I need not quote the familiar cases pointing to contagion which are given in Dr. Theophilus Thompson's well-known book, nor refer to the interesting record of Dr. Samuel Foart Simmons,|| for it is, of course, well known to all students of the subject that the doctrine of the spread of influenza by contagion has been held by successive generations of acute observers. Certain classical observations go to prove that, in some cases, at least, the infection is carried through the air even over the sea; but this does not prove that the disease is not contagious, nor even that it is not very generally spread by direct contagion.

On this question there are two distinct branches of evidence which deserve separate consideration: 1. The geographical distribution of the disease. 2. The date and conditions of its first appearance in any place.

(1.) If the infection were always air-borne the disorder would spread presumably in a definite way. It would not go from one large town to another, and miss the intervening country. What actually happened in the last epidemic, was that towns were affected first and the villages afterwards. A large town appeared to be the centre of infection for the surrounding country. The Report of the Local Government Board will doubtless throw much light on this subject, by giving the exact or approximate *date* at which the disease appeared in *every* town and village.

The Report of the Local Government Board for Ireland gives the following account of the spread of the disease in that country, in the late epidemic:—"It would appear that in a few districts on the east coast of Ireland cases of influenza were recognised in the month of October. In Banbridge Union, in the county of Down, a case is reported as having

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* An Epitome of the Reports of the Medical Officers of the Chinese Imperial Maritime Customs Service, from 1871–1882, compiled and arranged by Surgeon-General C. A. Gordon, M.D., C.B. London, 1884.

† "Among the Mongols." Gilmour.

‡ Unsere Zeit.

§ "Gentleman's Magazine."

|| "London Medical Journal," Vol. IX.

occurred on the 8th of October. In the county of Dublin, a medical officer reports that he saw a case on the 28th of October in Howth. In Drogheda Union, in the county of Louth, a case was noticed on the 11th of November. Cases are also returned as having occurred during November in the counties of Kilkenny, Meath, Kildare, and Wicklow. In November isolated cases are also returned from the counties of Mayo and Roscommon, in the west of Ireland. During the month of December there can be no doubt that typical cases of influenza were treated in more than one county in each of the four provinces. It was, however, in the first week in January that influenza prevailed generally throughout Ireland, and the period of its maximum prevalence would appear to have been towards the close of that month and during the early part of February."

With regard to the spread of the disease in England, Scotland, and Wales, the large towns were undoubtedly affected first and remote districts later. In London, Edinburgh, Colchester, Portsmouth, and Exeter the height of the epidemic was in January, smaller and remote places, *e.g.*, Wimborne and Inverness, were affected in February, whilst in North Wales the disease was raging in March. Now, Wimborne is between London and Exeter, and according to the air-borne theory of infection, that place should have been affected before Exeter.

2. A study of the circumstances under which influenza makes its appearance in any place is always instructive. During the epidemic of 1889–90 it was always found that isolated cases preceded an epidemic; and the first case of the disease was often found to have been imported from an infected place. I do not think that hitherto sufficient importance has been attached to these facts. Dr. Clemow, of St. Petersburgh, in a most interesting and instructive paper read before the Society of Medical Officers of Health,* said he considered the early cases "of very little importance in a comprehensive view of the course of the epidemic." "They may be looked upon," he said, "to use "Sir Thomas Watson's words, as the 'first droppings of the thunder "shower.' . . . . . . The arrival of the great wave of infective "material was not until much later, and must be taken as indicated "by the occurrence of the disease in large numbers of the population." The simile of Sir Thomas Watson is, I believe, more poetic than true. It was not that the isolated drops were followed by a wave of disease, but, to drop metaphor, *each isolated case became a centre of infection.* In many isolated outbreaks seen in London the patient first attacked had come from Paris, and I have seen many cases in which I believe the source of infection could be distinctly traced. Two instructive cases have been published by Dr. Delépine.† Dr. Blomfield, of Exeter, has kindly sent me the following case which occurred in the practice of Mr. J. D. Harris. "The first case I saw," he wrote, "was about "December 20th, in a young man living near Pinhoe. He came down "from London a few days before." Speaking of the spread of the

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* "Proceedings of Society of Medical Officers of Health." Vol. II., p. 361.

† "Practitioner." Vol. XLIV., p. 258.

disease he goes on to say, "About January 17th, 1890, these isolated "cases became epidemic, and during the week between January 17th "and 24th a very large proportion of the entire inhabitants of Exeter "experienced the complaint in some form."

Some striking instances of the spread of influenza by contagion were recorded by French observers.

The following case is by Professor Grasset, of Montpelier, and given on the authority of Dr. Bordone. M. A. went to Frontignan from Paris on December 15th. He was taken ill on the journey, and had influenza. On the 17th he dined at his own house, and the party consisted of ten people besides himself. On the 19th, five of these people were seized with influenza. These were the first cases in Frontignan. On the 18th, M. A. went to his office. On the 21st his *employé* had influenza. This man lived at Vic, a village some kilometres from Frontignan. He was the first sufferer from influenza at Vic. Five days after his seizure the patient's mother, who lived with him, had symptoms of the disease. From the 23rd of December the disease spread rapidly both in Frontignan and in Vic.

The case I next quote was recorded by Professor Bouchard on the authority of Dr. Tueffart, of Montbéliard. Influenza made its first appearance in Montbéliard on December 13th 1889. Before that date the disease was prevalent in the neighbouring towns (Neufchatel, Locle, Chaux-de-Fonds, Bienne, and Berne). On the 6th of December an inhabitant of Montbéliard remained for a great part of the day in a hospital containing patients suffering from influenza. He returned to Montbéliard and was seized with the disease on the 13th. On the 17th his two daughters were similarly affected. On the 19th his son began to suffer. This young man had a friend with whom he was brought into contact daily. On the 20th the friend had the disease. On the 21st the father of the latter took it. On the 23rd the brother-in-law of the last named was seized. On the same day the wife of the man who first failed with the disease was attacked, and at the same time three young people, friends or relations of the latter. Thus in ten days, from one source, the disease apparently spread to eleven people. While this was happening influenza was being imported into the town by other people. On the 21st it broke out at the house of a merchant who had lately returned from an infected house at Neufchatel. On the 22nd the disease was brought from Soleure by another tradesman.

Dr. Danguy des Déserts, chief medical officer at the training vessel, "Bretagne," at Brest, has reported the following facts:—The crew of the "Bretagne" consisted of 850 men. On December 11th an officer who lived ashore received two large parcels from Paris, and unpacked them himself; three days later he contracted influenza. On the next day, and the day after, his wife and his three servants were seized with the malady. These five cases were undoubtedly the first cases seen at Brest. On the 14th the officer went on board the "Bretagne," and remained on board for 48 hours. On the 16th the first case of influenza was seen on the vessel. From the 17th there was an epidemic of

influenza amongst the crew, and from 20 to 45 new cases occurred daily. Some of the officers and non-commissioned officers were allowed to go to their own homes for treatment. In every case the disease spread to the families of those officers and non-commissioned officers. At the time of the epidemic on the "Bretagne" there were two other training vessels moored near her, the "Borda" and "l'Austerlitz." *No case of influenza occurred on either of those vessels.*'

There are cases pointing to the spread of infection by parcels, but they are comparatively few. I have already quoted one possible case, Dr. Bezley Thorne* and Dr. Clemow† have published others. It is not contended that that method of infection is a common one, although it would be improper to ignore it entirely.

The conclusion to which the foregoing evidence points, is that influenza spreads from person to person by direct contagion, and for my own part I believe that it was *chiefly* spread in that way in this country. There is at least distinct proof that contagion plays a great part in the spread of the disease.

The question I wish now to consider is, can anything be done to prevent the spread of influenza? The matter may conveniently be considered under three heads: (1.) General Hygiene. (2.) Prophylactics. (3.) Avoidance of infection.

I. General Hygiene.—It is important to notice that hygienic conditions check the spread of all epidemics. As Sir Joseph Fayrer has pointed out,‡ experience proves that in the case of all epidemics "sanitary "measures have the power of controlling or modifying if not of pre-"venting them." This was abundantly shown in the late epidemic, and I have no doubt that London suffered less than some continental cities, because its general sanitary state was less unsatisfactory. Mr. E. A. Hunt, of Colchester, in a letter to me says that one of the things which struck him most about the late epidemic was the rapid spread of the disease under unhygienic conditions.

II. Prophylactics.—Quinine has been strongly recommended as a prophylactic for influenza, but its claim to be considered one is at least open to doubt, for cases of the disease have occurred in patients who were at the time taking full doses of the drug. Dr. Bezley Thorne§ recommended that the eyes of people exposed to infection should be bathed with a solution of boric acid, and found that none of those who adopted this practice suffered from the disease. A precaution so simple, founded on a scientific theory, and devoid of danger, merits more general adoption than it obtained during the last epidemic.

III. Avoidance of Infection.—Much may be done to prevent the spread of the disease by avoiding direct infection. It might be argued that the only way out of the (infected) air is into the grave, but this is to take an exaggerated view of the danger of the part played by the wind

* "Lancet," January 18th, 1890.

† Op. cit.

‡ "Universal Review," January 1890.

§ "Lancet," January 18th, 1890.

in the spread of the disease, and to ignore the fact of the contagious nature of the malady.

During the late epidemic the British matron was behind the tent dwellers of Mongolia in her indifference to the health of her guests, for, as Mr. Gilmour tells us,* when influenza exists in northern China the natives will warn the stranger and say, "dismount at my tent another time." In England, parties often took place as usual whilst the family of the host was suffering from the disorder. I wish to insist on the fact that no one suffering from the disease has a right to spread it to others, and that the hospitality of an infected house is to be avoided. Aged people, and those in delicate health, should avoid all contact with patients who have influenza, and as a precautionary measure letters and parcels should be disinfected.

Again, in the case of public institutions great care should be taken not to introduce the disease from without. During the late epidemic Dr. Clemow† found that at Earlswood, although over a quarter of the total number of the attendants who did not live in the asylum suffered from influenza, none of the inmates suffered. At Broadmoor,‡ on the training ship "Mount Edgcumbe,"§ and at the Royal Asylum, Morningside, the disease when once introduced spread freely.||

Elementary schools should be shut up in the case of an epidemic, and medical officers of health should be at once informed of any outbreak. An interesting paper by Dr. Thresh,¶ of Chelmsford, shows how this plain duty has been neglected by school managers and with what results.

The Influence of the Nile on mortality in Egypt.

BY

GREENE PASHA, Cairo.

The ancient land of Egypt has been likened to a palm tree—a tall, branchless stem; roots stretching far south into central Africa, and a feathery tuft of foliage spreading out to the north on the Mediterranean coast. It is in fact simply a groove worn in the desert by the Nile, and made habitable by its waters.

* "Among the Mongols." Gilmour.

† Op. cit.

‡ "The Influenza Epidemic at the State Criminal Lunatic Asylum, Broadmoor, Berks." By Reginald H. Noott, M.B. "Lancet," June 7th, 1890.

§ George Preston, L.R.C.P. March 1st, 1890.

|| George M. Robertson, M.B., and Frank A. Elkins, M.B. "British Medical Journal," February 1st, 1890.

¶ Lancet," June 7th, 1890.

The total length of the Nile is about 3,370 miles; it drains 900,000 square miles, and from the point where the Atbara, or Black Nile, joins it, near Berber, it receives no affluent whatever, large or small. The distance from Berber to the sea is 1,200 miles.

At Assouan, the first cataract, the width of the river is 3,900 feet; at Cairo 2,900 feet. During this part of its course the fall is estimated to be from two to three inches a mile. Below Cairo it divides into two branches—the Rosetta or Canopic, and the Damietta or Phatnitic, thus forming the delta. Throughout the Delta the fall is less than one inch per mile.

The total cultivable area of Egypt to the first cataract is said to be 11,300 square miles, of which the larger half, *i.e.*, 6,300, belongs to the Delta, which is accordingly a little more extensive than Wales. The area actually under cultivation and paying revenue is probably not more than 7,800 square miles.

The density of population is enormous, amounting officially to 587 souls per square mile. In reality it is even greater than this, for the uncultivated parts are very sparsely inhabited by Bedouins, and the last census, taken in 1882 during the rebellion, undoubtedly understates the number of inhabitants, which it fixes at 6,592,000 sedentary, and 225,000 nomadic.

The people live chiefly in clusters of wretched huts, crowded together in the most unhygienic manner in order to economise space and leave as much land as possible for cultivation. Their only source of water supply is the Nile and the canals it gives off, for of springs, properly so called, there are none, and the rainfall is so small that it need not be taken into consideration. It is true wells exist, but they are all more or less brackish, being fed by percolation from the river through a saline subsoil.

The Nile being the sole source of water-supply in Egypt, it is the duty of all who in that country are concerned for the public health to use every means in their power to prevent its becoming a source of danger. This is no light task, for it is unfortunately the universal habit throughout the land to get rid of filth and refuse by depositing it in the river.

In an article by Dr. Grant Bey, whose experience of Egypt is second to none, I find the following remarks:—"The Nile from the "middle of May to the middle of August is little better than an open "sewer; and its water at that period, however well filtered, is not "potable."

That this should be so is not surprising, for countless Mosque and other drains discharge into it; slaughter houses, tanneries, sugar factories, and all kinds of insalubrious establishments make use of it and its canals as common sewers, and the population in general resorts to its banks for the purposes of nature, instead of, as in India, frequenting the fields where their manure would be of service.

As long as the current continues strong, this pollution does not so much matter from a practical point of view, though of course æsthetically it is indefensible; but when once the stream diminishes, the evil effects become apparent, and when stagnation takes place, the results are fatal.

Sir Guyer Hunter, in a report presented to Parliament in 1883, states:—"The rivers and canals in Egypt, instead of being protected, as " they should be, from pollution, are ordinarily made use of as the " easiest and readiest means of disposing of all dead animals, excreta, and " refuse and filth of every kind and description. If a small factory be " erected on the bank of the river, the privies, as a matter of course, are " built over the stream. It never seems to have struck anyone that " there was any other way of disposing of filth accumulation." * * * " The water of Cairo in July contained living organisms in considerable " numbers, and among them bacteroid bodies, and had more the " character of pond water than that taken from a running stream."

These descriptions could be added to *ad infinitum*. Without any manner of doubt, Nile water, though excellent and wholesome at flood time, becomes detestable and pernicious when the current ceases.

Water may possibly be as great a purifier as the living earth, but if so, it must be while in motion. When stagnant, or nearly stagnant, a river receiving putrescible matter in large quantities, to say nothing of specific germs, must inevitably become unfit for drinking purposes.

When the river is low, and its current reduced to a minimum, that is to say, from about the end of March to the middle of July, generally speaking, the mortality steadily rises, and during the whole or a portion of this period the death-rate usually exceeds the birth-rate.

Two towns *only* show a marked exemption from this rule, namely Damietta and Rosetta, in neither of which throughout the whole five years, 1886–1890, did the mortality exceed the natality at this season of the year. This is a most remarkable fact, and will be dwelt on later.

Guiseh. A small town situated on the western bank of the Nile, a few miles south of Cairo. In 1886 the death-rate was high during the early part of the year, exceeding the birth-rate till the middle of May. This somewhat masks the *low-Nile* rise of mortality, which is nevertheless present, though not well marked. In 1887 the death-rate presented no very salient peculiarities; but in 1888, the low-Nile rise was very prominent, as it was also in 1889, and to a less extent in 1890.

Cairo. In 1886 and '87 the low-Nile rise was prominent; in 1888 it was extremely well marked; in 1889 somewhat less so; and in 1890 it did not appear at all. Owing to the large populations, these curves are less abrupt for Cairo and Alexandria than for the other towns.

Mansourah. This town is situated on the Damietta branch of the Nile about 50 miles from its mouth. It is a large, busy place, considered

one of the most rising in Egypt. A canal on a higher level than the Nile passes to the westward, and contains water said to be purer than that of the main stream; but in consequence of its being somewhat farther from the town than the river, it is probable that the inhabitants do not use it to any extent. In 1886,' 87, and '88, the low-Nile rise was very prominent; in 1889 it was slightly less so; but in 1890 the increase was marked to a very considerable extent, lasting from February to the middle of July.

Alexandria. This wealthy city obtains its water-supply from the Mahmoudieh Canal, which is about 45 miles long, and which used formerly to be fed from pumping stations on the Rosetta branch of the Nile. In December 1890, on the completion of the great Barrage, this system was discontinued, and the supply is now furnished to the Mahmoudieh through a new canal, called the Rayah Behera, which takes its origin at the Barrage itself. Whether this arrangement will have any effect on the public health at Alexandria or not, remains to be seen. During a great part of its course the bed of the Mamoudieh is higher than the surrounding country, which is liable at times to be flooded; the inhabitants consequently build their villages on the banks of the canal, and all without exception drain, and throw their refuse into it. The low-Nile rise of mortality was well marked in 1886. It was also apparent in 1888 and '89, though somewhat masked in the latter by the high birth-rate that prevailed in the early part of the year.

Damanhour. The source of water-supply to this town is the same as for Alexandria. The low-Nile rise was well marked in 1886 and '89, and slightly so in 1890, but it was not prominent in the other two years.

Tantah. This important town is dependent for its water on a small canal, a branch of the Bahr Mehalla, and is considered in this respect one of the worst supplied in the Delta. During the whole five years the death-rate rose steadily during the low-Nile season, and fell soon after the river began to rise. Every year the mortality exceeded the natality during the greater part of the time, except in 1890 when for a considerable space they were equal.

Mehalla. The water supply of this town and of the next, *Chibin*, is thought to be superior to that of Tantah because it is taken from a larger canal. The low-Nile rise was nevertheless extremely well marked in both places, except at Mehalla in 1887. The exceptionally high death-rate at Chibin in 1889 was said to be caused by an epidemic of measles.

Zagazig. This town is also supplied from a canal, the Bahr Mohez. In 1889 there was no increase in the mortality at the low-Nile season, but in the other four years it was sufficiently well marked. In the whole five the death-rate was higher than the birth-rate for a portion of the time.

Port Said. The water supply is brought as far as Ismailieh in the canal of that name, and from thence in iron pipes to the town. In four

out of the five years the low-Nile mortality was well marked, and the deaths also exceeded, or equalled, the births.

It will be seen that in each of these ten towns, the mortality rises while the Nile is falling, and falls as soon as the current is re-established, during at *least* three out of the five years; and that when the death-rate exceeds the birth-rate, this almost invariably occurs while the river is low, or immediately after it begins to rise, before the effects of the foul water may be supposed to have passed away.

Taking the ten towns in this order, I find that in Guiseh the low-Nile rise of mortality is marked in four years out of the five, in Cairo also in four, Mansourah in all, Alexandria and Damanhour three each, Tantah all, Mehalla four, Chibin all, Zagazig and Port Said four. Total 41 out of a possible 50.

The excess of deaths over births is apparent at least 38 times at the same season, and only once at any other time of the year.

We now come to the exceptions—*Damietta* and *Rosetta.*

The first is situated on the branch of the Nile bearing the same name, at a distance of nine miles from the sea. It has a population of over 43,000 inhabitants, and has always borne the reputation of being a very filthy town. During the last cholera epidemic in 1883, it attracted a great deal of attention as being the place where that disease first made its appearance in Egypt, and most people who have written about it are unanimous regarding its insalubrity.

It is evident therefore that Damietta, if no worse than the other towns mentioned, is certainly no better as regards its sanitary condition. And yet we find that during the whole five years 1886–1890, the death-rate did not once surpass the birth-rate; and that the low-Nile rise of mortality is conspicuous by its absence. There is even a tendency to a fall of mortality during this season, and to a rise after the Nile flood is established.

In Rosetta there is absolutely no low-Nile rise at all during the five years; and of the two periods when the deaths exceeded the births, one was in August-September, and the other in March-April, consecutive to a higher rate earlier in the year. The low-Nile season, judged by the death-rate, is far the healthiest part of the year.

A high degree of mortality during the summer in Egypt is customarily ascribed to excessive heat, general insalubrity, lowness of ground water, ingestion of unripe fruit and damaged vegetables, measles, &c. This may be partly true, but inasmuch as all these factors exist equally in Rosetta and Damietta as in the other ten towns, it is permissible to seek for some other cause as well, and in my opinion it is the water-supply that is at fault.

Owing to the proximity of Damietta and Rosetta to the Mediterranean, the inhabitants of these towns cannot drink Nile water when the river is low, on account of its becoming brackish as soon as the current ceases to be able to repel the sea. They are therefore compelled to store water in cisterns during the flood-time, for use when the river becomes

unpotable. In other respects, the whole twelve towns exist under similar conditions, and it is only in their summer water-supply that the two latter exhibit any divergence. The conclusion that there is a connexion between water-supply and mortality in Egypt is, I think, unavoidable.

This is no new idea. As long ago as 1068 A.D. the celebrated Arabian physician, Ibn Radouan surnamed El Masry, or the Egyptian, wrote as follows —"Nile water to be fit for drinking should be drawn " where the current is strongest, and where there is the least amount of " matter undergoing decomposition. * * * Nile water becomes " absolutely bad when the river falls and the current almost ceases. " It should then be boiled and clarified. * * * Egyptians assert " that Nile water is never susceptible of deterioration, that it always " remains good; but you, my disciple! you will not follow their " example; you will always submit it to purification."

I now turn to the weekly mortality in Cairo and Rosetta under and over five years of age. In the latter town, the death-rate under five contrasts most favourably with that of the former. There is no rise at all during the summer months, whereas in Cairo each successive year produces, so to speak, its mountain. A diagram of this weekly mortality shows clearly enough why it is so little attention is paid to the epidemical death-rate that habitually prevails during the low-Nile season in Egypt. It is only the little ones that perish. Were such a mortality owing to cholera, there would at once be a panic, and commissions and committees, extraordinary and special, would speedily be started in the hope of frightening away the pestilence; but inasmuch as this excessive death-rate under five years of age takes place unfailingly every year, it has come to be looked on as a normal occurrence. Familiarity breeds contempt, and very little notice is consequently taken.

Cholera visited Egypt in 1850, '55, and '65, when on each occasion a regular *hegira* of the Europeans took place. In these three epidemics there were in Cairo 12,132 victims to the disease, the average duration of each outbreak being about three months. In the three *consecutive* years, 1887, '88, and '89 the number of children under five who succumbed in Cairo during the low-Nile season (thirteen weeks), was 11,546, or little less than the cholera mortality of 34 years, *i.e.* from 1832 to 1865.

With a pure water-supply and efficient drainage and ventilation, I believe that more than half this enormous mortality among infants would be avoided, and the death-rate speedily diminished to the standard of Rosetta.

The problem of procuring a pure water-supply for Egypt, during the summer, is by no means a difficult one; money is all that is required. Several projects have been elaborated, all more or less feasible. Monsieur Prompt, Administrator of the Railway Department, proposes to construct *barrages* in the upper reaches of the Nile, so as to retain the flood water till it was required in Lower Egypt. The objection to this plan from a sanitary point of view is obvious. The stored water would be exposed to the numerous sources of contamination already indicated; the measure

would be palliative, not radical. Mr. Cope Whitehouse's scheme for storing the superfluous flood water in the depression discovered by him in the Raiyan desert is completely free from this objection. The pure water from the Abyssinian mountains would there be absolutely safe from all danger of being fouled, and when let go at the proper times, would bring down to the teeming millions of the Delta health and wealth instead of deadly poison. Mr. Whitehouse's plan has been pronounced feasible by the highest authorities; the only objection advanced is the cost, which has been estimated at a million and a half. The gain in life and health resulting from such an expenditure, would, in a few years, be equal to five times that sum, large as it is. It is not only deaths that would be prevented; each death represents several cases of sickness, and each case of sickness involves a loss to the State.

As regards the particular poison which is the immediate cause of the low-Nile mortality, I can only offer a suggestion. Enteric fever is commonly supposed to be rare among Egyptians, but whether this supposition is owing to real absence or to non-recognition, is open to question. At Kasr-el-Aini hospital there has not been a single case treated during the last seven years, and Dr. Milton has only seen the disease once in a native since he has been in Egypt. Enteric has never been recognised during life among the Cairo foundlings, of whom 30 6 per cent. died last year, but in some autopsies that were made there was found very distinct infiltration of Peyer's patches.

During the summer, the vast majority of the deaths among children is ascribed in the official returns to *gastrite*, *gastro-entérite*, and *diarrhée*. It is possible that among these, there may be cases of enteric; and some observers go so far as to say that *all* native children pass through the disease in their infancy, and that hence ensues the immunity of the adults.

That enteric poison exists in the country, is amply proved by the immense prevalence of the affection among the soldiers of the army of occupation. A great authority has justly said "There is no doubt what-"ever, that whenever excrement is mixed with water we are always in "danger of typhoid." The Nile in summer always contains tons of excrement.

Since the greater portion of these notes was compiled, a most remarkable confirmation of the theory I am seeking to establish has occurred. In the return from Rosetta for the week ending 23rd April last, I observed that the deaths exceeded the births, the numbers being respectively 16 and 13. The following week they were equal at 17 each, but during the next two weeks there were 25 and 18 deaths, and 18 and 16 births respectively. As the mortality had never at this season exceeded the natality during the previous five years, I called on the local sanitary officer to report on the circumstances under which this now occurred. The following is a translation of his reply.

Rosetta, 20th May, 1891.

"I beg to inform you that during high-Nile, that is to say from "August to end of February, all the inhabitants of Rosetta, rich or

" poor, use Nile water for domestic purposes, but from the fall of the
" Nile, and its *barrage* to the south of the town, an operation performed
" in March, the indigent inhabitants were accustomed to use water
" stored in cisterns during the flood at the expense of the State, people
" in easy circumstances making use of the water from cisterns of their
" own.

"This system was maintained till last year, when unfortunately orders
" were given to cease storing water in the cisterns designed for the use
" of the indigent classes, as the latter could supply themselves from the
" Rosetta Canal. This year the current in the canal is occasionally
" interrupted and sometimes ceases to flow for a week at a time. I have
" had occasion to see the poor inhabitants make use of the stagnant
" water of the canal from which arose a fetid odour, but which they were
" forced to use as their means did not permit them to procure cistern
" water.

" This state of things has necessarily caused an increase in
" the number of deaths in comparison with other years, and if remedial
" measures be not adopted, will become a permanent source of danger for
" the inhabitants."

This letter speaks for itself. The excess of deaths over births still continues* in Rosetta. In Damietta the Government cisterns were filled as usual last year; the deaths have not exceeded the births, and the average mortality has been about the same as for the previous years.

Observations on Malaria and Enteric Fever (including the so-called Typho-malarial and Blackwater Fevers), and on the possible Antagonism between Malaria and Phthsis.

BY

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Without referring to the etiology of malaria, I think that there is sufficient evidence to show that malaria is a specific disease, as specific indeed as the eruptive fevers, and it cannot be said even with regard to them that we are perfectly familiar with their origin. This much, however, we do know, that malaria exists in soil rich in decomposing organic matter which requires a certain amount of heat and moisture for the production of the poison. It is of course objected that malaria may be found in dry soils. This is true, and it is also true that in places where there is a dry soil, with the necessary atmospheric temperature, one has only to irrigate that soil for agricultural purposes and malaria will make its appearance. I think that the fact is too

* 25th June 1891.

often lost sight of that in dry countries where there is only a very moderate rainfall malaria is not met with. Again, there is an analogy between malaria and other diseases in regard to the method by which the poison gains entrance into the body; it may either be introduced by the lungs in breathing or by food contaminated with the poison (and this is a fact which I think is too frequently ignored); again, by drinking water, for surely there are sufficient proofs that infected water may convey the poison.

It has been said that the various forms in which malaria manifests itself confute the theory that it is a specific disease; I do not think so, because we know that many other specific diseases are modified by locality, and that even different epidemics of, say, scarlet fever or measles, may be either mild or severe, although we are unable to say exactly why.

We know that malaria acts as other specific diseases. It enters the body; it has a period of incubation which varies in length, probably in proportion to the virulence of the poison and the dose. The clinical phenomena of the malarial paroxysms are well recognised, and finally it is to a greater or less extent eliminated from the body by the skin, the kidneys, or the gastro-intestinal tract.

That there is a certain power of resistance to malaria in some individuals I would certainly be the last to deny; and it is evident that this power of resistance varies, not only with the individual constitution, but with the state of the general health, which is what happens in regard to all specific diseases.

Apart from all this, one finds definite post-mortem lesions associated with malaria; and not only so, but children born of malarious parents may exhibit external signs of cachexia due to malaria; and should they die, well-marked post-mortem evidence that they have been affected by the disease. We know that a fœtus may suffer from malarial paroxysms in utero, and Baxa, Luck, Sous, and others have shown that it is possible for a healthy child suckled by a malarious woman to contract the disease. Personally, I would go further than this, for I published two cases in the "Edinburgh Medical Journal" (June, 1889), which I think demonstrated that a father may transmit a malarial taint to his child, the mother remaining unaffected.

When a person has once suffered from malaria, he may, undoubtedly, be subject to renewed paroxysms of fever for many years, if not for life; but here again we find an analogy between malaria and other diseases, for instance, syphilis and rheumatism. It is a matter of common occurrence to find that even years after a person has returned from the tropics an attack of malaria may be induced by a chill, by fatigue, by exposure to the sun, or by operative interference or labour. I know of many instances where the two latter occurrences have induced intermittent fever in adult life in individuals who had left India when children. I find, too, it is often forgotten that children born in India may have, after their return to this country, the course of other diseases, such as measles or bronchitis, markedly influenced by the malarial poison which has been latent in their systems.

I must make one remark with regard to chill. Although I firmly believe that chill may be the exciting cause of an attack of ague, or that it may, by lowering the powers of resistance, predispose a person to an onslaught of malaria; yet I confess I cannot understand how chill can be credited with being the specific cause of malarial disease. I once saw the construction of a new moat commenced at Mruli, an Egyptian frontier station in Central Africa. Early one morning 37 Negro soldiers began the excavation; by 10 a.m. 29 were struck down by malarial fever, and 17 were buried before sunset. This could not be due to chill.

But if the facts I have mentioned were not convincing to my own mind that malaria was a specific disease, yet the recent bacteriological investigations of malaria seem to me to prove the point indubitably. The researches of Laveran, Golgi, Machifava, and Celli, confirmed by Councilman in Baltimore, Carter in Bombay, Jaksch of Prague, as well as Osler and Abbot, cannot be set aside; and I have had repeated opportunities recently of being able to confirm their results in observations made on patients who have returned from India, from the West Coast of Africa, and from East Central Africa. I may say that all my attempts at cultivation have up to the present been failures. I had hoped to have the results of some cultivations which Dr. A. Edington was making for me to lay before you; he has obtained various pure cultivations from blood I took from a patient suffering from intermittent fever, and from another suffering from dysentery, but unfortunately his departure for the Cape has prevented him from giving me any report.

I must now proceed to give a brief account of malaria as I met with it in Central Africa. The area referred to extends from Khartoum in the north, as far south as the Victoria and Albert lakes, along the whole valley of the White Nile, and also in the Rohl and Bahr-el-Ghazal districts, and in Darfour. The distribution of malaria in this region is unequal, and, as elsewhere, the topography of the country exerts an influence both upon its frequency and its severity. In low-lying, swampy regions, malaria is very common, the natives suffering to a considerable extent from mild attacks of intermittent fever. Occasionally one sees a case of well-marked remittent, but perhaps the most frequent variety met with is a form which at first sight appears to be a continued fever lasting from five to seven days. When one, however, examines these fevers carefully, one finds that they are really either mild remittent (for there are distinct remissions, which however, must be carefully looked for) or they are quotidian with badly marked paroxyms. A very brief cold stage occurs daily, it can hardly be called a cold stage; then follows 18 or 20 hours of hot stage with a moderate temperature (102–103), followed by an hour or so of apyrexia after a very slight sweat.

In the higher regions the fevers become more rare until one reaches districts having an altitude of from 3,000 to 4,000 feet, where they almost entirely disappear. A good example of this is to be seen in the country to the N.W. of the Albert Nyanza, in Central Unyoro,

in the Shuli district to the S.E. of Dufli, and in Uganda, in the Kahura district. I may say, as a general rule, that the natives are comparatively free from fever, at any rate from any severe form. With regard to the effect of malaria upon Europeans and Egyptians, one notices marked differences; and here the personal equation comes notably into play. Some suffer very little from malaria, others suffer from severe remittents, and from what are called bilious remittents and Blackwater fever. To this latter, I shall refer presently. On the whole, Europeans suffered far less from anything more than an occasional attack of typical intermittent fever than did Egyptians. Inactivity, severe marches in the sun, or by moonlight, and fatigue were the predisposing causes for attacks of fevers in Europeans. I may say, in passing, that quinine acted promptly except in the remittent fevers, where I found that Warburg's tincture was invaluable. I may also say a word with regard to the prophylactic administration of quinine. During the first year I found that its administration in prophylactic doses certainly appeared to prevent the frequency of attacks; but it had this disadvantage, that when an attack of fever occurred very large doses were required to break it up. I subsequently, therefore, only gave prophylactic doses of quinine when there was special exposure, and the results were far more satisfactory.

In all the old Egyptian stations which I visited, the Egyptian troops and officials suffered excessively from malaria. It was very fatal to them, or if not fatal, it induced such marked debility that they were greatly incapacitated for ordinary employment. This I attribute to their indolence and excesses more than to any special susceptibility to malaria.

I have said above that the natives suffered comparatively little from malarial fever. It must, however, be distinctly understood that this was only when they were living in their own districts. I repeatedly found that when as porters they were taken long distances from home they suffered from as severe fever as did either Europeans or Egyptians. Indeed, so recognised was this fact, that it was the rule, wherever possible, for the officers never to send native porters for more than three or four days' journey.

I found that the "spleen test" was very useful in ascertaining approximately the salubrity of a district. It may perhaps be interesting to mention that in those parts of Central Africa which I know, malaria seems to act as it does elsewhere; the cultivation of new districts, making roads, and digging trenches, being accompanied with severe outbreaks of disease. I often noticed the well-known fact that belts of trees frequently act as a filter for the malarial poison, and on several occasions I saw disastrous results follow the intentional or accidental destruction of such a barrier.

In concluding this part of my subject, I may mention that the Bahr-el-Ghazal district is, owing to its very abundant water-supply, and its many swampy areas, excessively malarious, but that Darfour, to the north of the Bahr el Arab, is comparatively exempt.

I must now pass on to deal very briefly with the subject of enteric fever, which exists in Central Africa. It is true that I only had

opportunity of proving its existence by post-mortem examination on seven occasions. Still I am convinced that I saw numerous cases in various places. At Khartoum it is certainly endemic, and no wonder, when one calls to mind the filthy condition and want of all sanitary precautions in that town and the quagmire into which it was yearly transformed at high Nile. In the hospital there I saw well-marked cases, and the doctors told me that after the inundation the disease spread all over the so-called island of Meroe. In all the districts I have mentioned above, as also in Kordofan, I met with cases, but they varied in frequency not so much with the character of the country or the climatology as with the habits and customs of the natives and their sanitary surroundings. The disease was most frequently seen in the larger towns (if one may designate collections of 2,000 or 3,000 huts as towns) in the Bahr-el-Ghazal district. There, where the slave-dealers were in the habit of crowding together thousands of slaves, the filthy condition of the places can be better imagined than described, and it was in these hotbeds of filth and vice that I saw most cases of enteric fever. Still, I met with the disease at Bohr on the White Nile, at Foweira, at Magungo (just to the north of the Albert Nyanza), and I witnessed one epidemic in Uganda. I say epidemic, because it was curious to notice that, generally speaking, enteric fever seemed to stop short directly an area was reached in which the banana forms the staple food of the population; it was far more frequently met with in those districts where the people lived chiefly upon grain. Although I considered the subject on the spot, I was not able to make up my mind whether the method of grinding the grain between two comparatively soft stones might not be the exciting cause. In Dara, in Darfour, and at El Obeid in Kordofan, cases were frequent, but at Dara I was told that the disease was of much less frequent occurrence subsequent to the filling up of various wells and a large water-tank in the town.

I never saw a case of enteric fever except in young adults, that is to say, in persons from 15 to 30, nor did there appear to be any seasonal influence as an exciting cause to the disease.

I must now pass on to the vexed question as to whether typho-malarial fever exists or not as a separate disease. I do not believe that it does. My remarks, however, apply alone to Central Africa. I hold that in those cases where there is a difficulty in diagnosis between a severe case of remittent fever and a case of enteric fever, the difficulty rests in the fact that one may have enteric fever occuring in a patient who is suffering from malarial cachexia or malarial fever; or we may have a case of severe remittent fever accompanied by great prostration, delirium, or stupor, in fact, those various symptoms to which the term "typhoid state" is applied. The chief reason I have for holding this opinion is that the cases in which dubiety existed were (exclusively met with) amongst Egyptians and three other persons—an Englishman, a Maltese, and a Greek. I had little or no difficulty in recognising enteric fever when I came across it in natives. In all the other cases the individuals had either suffered from malaria to a considerable extent and were then attacked by enteric fever, or they were suffering from severe remittent fever.

In these cases the diagnosis was certainly very difficult, and indeed at times I failed to come to a definite conclusion as to which disease I was dealing with. Practically, however, whenever I found that quinine or Warburg's tincture made no impression on the disease, I considered that I was dealing with enteric fever; and in one case, at any rate, my supposition was confirmed by a post-mortem examination.

When I saw the cases from the commencement I found less difficulty in deciding the diagnosis, and I may state that the initial symptoms were, as a rule, well-marked and as follows:—In remittent fever the patients usually complained for a day, rarely for two, of general malaise, frequent vomiting was a prominent symptom; then followed a cold stage in which, however, the rigors were nothing like so well-marked as in ordinary intermittent fever; at the same time the temperature rose rapidly, usually to 105° F. or more, within eight or ten hours. The tongue was foul and the patient complained of severe headache and splenic pain. The pulse varied from 120 to 130; constipation was usually present. When closely looked for, a distinct remission was ascertained to take place, most usually in the early morning, a difference of from 3° to 4° F. being often noticed.

On the other hand, in the cases of enteric fever the patients complained of being out of sorts for several days. No rigors were complained of, but slight shivering or chilliness was present. The temperature rose gradually until on the fourth or fifth day the thermometer registered from 105° to 106° F., and as a rule there was a distinct difference between the morning and evening temperature. The tongue was not nearly so coated as in the cases of remittent fever, nor was the headache so severe. The pulse too was lower, being rarely over 100. The usual abdominal signs were almost invariably present, and in at least two-thirds of the cases the spots were significant. The diarrhœa was, as a rule, severe. The influence when exhibited in these cases was practically nil.

I may mention that in the Egyptian cases relapses were very frequent in enteric fever, owing to difficulty in dieting the patients, and to the gritty nature of the food it was difficult to prevent them from obtaining. Naturally, I was unable to make any bacteriological observations such as would now-a-days undoubtedly help to clear up the diagnosis in doubtful cases. I noticed in the New York Medical Journal for 1890, a report of an inquiry which was made in the marine hospital at New York upon patients suffering from malarial and enteric fever, as to the presence of the plasmodium malariæ in the blood and Eberth's bacillus in the intestinal canal. The investigation covered 100 cases. The conclusions arrived at were that malarial and enteric fevers do not antagonise each other, that sometimes a differential diagnosis between the two diseases was impossible, and that there exists a mixed form of the disease in which both Eberth's bacillus and the plasmodium malariæ were found.

I have now a few brief remarks to make on the subject of the so-called blackwater fever. I am free to confess that it was not till after my return from Africa that I heard of this fever. Indeed, it is hardly

ever mentioned by writers on tropical diseases, excepting by French authors. In looking over my African notes I have found various cases, 17 in all, in which "blackwater" occured as a prominent symptom. One patient, a Syrian, died. I have also seen two cases in Edinburgh where the symptom has been a prominent one in malarial fever suffered from subsequent to a tropical residence.

The first case I met with was in a Syrian. He had had nine or ten moderately severe attacks of tertian ague within a period of six or seven months. He was very run-down, anæmic, and owing to his voracious appetite which he would never control, he had also suffered from numerous bilious attacks. On December the 22nd and 23rd he ate more than usual; on the 24th he was exposed to the sun, and at night he had a severe attack of vomiting and shivering followed by fever with a temperature of 104·5°. The temperature had fallen by next morning, and the vomiting had ceased, but he was very prostrate. We were compelled to march on the 27th, the patient being carried. The same night we camped in the open, and a thunderstorm accompanied by torrents of rain and lasting for several hours soaked everyone. A night attack by natives, which was continued most of the next day during the march, prevented anything being done for the patient until late in the afternoon, when he complained bitterly of severe shivers, pains in his head, abdomen, and loins, and he was so frightened by the urine he passed that he collected some. It was thick, porter like in character and frothy, sp. gr. 1030 and very albuminous. The patient was deeply and uniformly jaundiced, temperature 103°, pulse 120, and during the night vomiting of a bilious character recommenced, accompanied by purging. Notwithstanding all treatment, the patient died on the 29th of collapse, his urine having been suppressed for some 12 hours before death.

This case fairly represents what I noticed in all my other cases. Errors in diet, fatigue, a bad wetting or exposure to the sun, in debilitated patients in very malarious regions brought on a severe remittent with one or other symptom markedly prominent. At one time there was vomiting almost incessant, at another severe diarrhœa, at another delirium or stupor, or again, as in the above case, the urinary symptoms were most striking. I cannot help thinking that it is a mistake to give a distinct name to fevers of this kind, for although the exciting cause may give rise to special symptoms, they are not due to anything save to malaria, and it seems to me that if we use such terms as bilious, remittent, or still more, blackwater fever, it only tends to lead us to treat symptoms, and if so, and if we do not steadily keep in view the malarious nature of the disease and do all in our power to combat it with quinine, &c., we cannot avoid injury to our patients, and maybe shall lose them. I quite agree with Dr. Eyles when he writes, "A patient has an attack of what may be a mild remittent. At "first he takes it, I had almost said cheerfully, as he has taken other "attacks, but he passes water and it is black, he has 'blackwater "fever' and is panic struck, and the medical attendant has to deal with "a far more formidable complication than hæmoglobinuria or jaundice, "viz., panic."

All I need say more on these cases is, that in all which I saw in Africa the urine contained bile, and I think that the symptom was, therefore, due to hepatic complication. At the same time, doubtless in some cases the colour is due to the products of the destruction of the blood by the intense malarial poison.

It is otherwise with the cases I saw in Edinburgh. One was a patient from India, who, though he had resided there for seven years had never had fever till on the voyage home, when he had an attack in the Bay of Biscay. He had an obstinate attack, he told me, which lasted five weeks. He next suffered from an abscess of the liver, which discharged through his lungs. Six months later I saw him in Edinburgh. For three days he lays with a temperature of 104°–105·2°, when suddenly he complained of a great pain in his back and soon thereafter passed a considerable quantity of port-wine-coloured urine. The sp. gr. was 1028, and there was about one-fourth albumen. On standing, the urine deposited amorphous urates, urinary epithelium, and a very few red blood corpuscles, as well as a number of brownish casts and much pigmented granular matter. Subsequent to the passage of this urine, the secretion was entirely suspended for 20 hours, and for the next ten days the patient passed at least once a day, after one or two rigors and a slight rise of temperature, urine of a like nature. Save for a trace of albumen, the urine was normal during the intervals. The patient ultimately recovered.

The other case was one of ordinary paroxysmal hæmoglobinuria. The only noteworthy point was that the patient had previously had numerous attacks near Lake Nyassa, where he had resided for two on three years, and where he had experienced 59 more or less severe attacks of ague.

In what I have said I have purposely avoided mentioning authorities, as I wanted to give the results of my own observations as simply as possible, and not to obscure the facts by comments or theories. With regard to the details of the cases, as it was impossible to give them in full in the time allowed for this paper, I preferred to leave them out altogether. I may take some future opportunity of publishing them if they are thought to be of sufficient interest.

In conclusion, I should like briefly to call attention to the possibility of there being an antagonism between malaria and phthisis.

I was surprised in my journey to Central Africa to notice the distribution of phthisis, for although bronchitis, pleurisy, and pneumonia were constantly seen in nearly all the districts through which I passed; the cases of phthisis which I was able to observe were few and far between, and corresponded in a marked manner with the absence of malaria, at any rate, in its most intense forms. From Khartoum, along the valley of the White Nile, as far as the Albert Lake, through the swampy districts of Unyoro and Uganda, I can recall having seen very few cases of phthisis (in Uganda some 18 or 20). Subsequently, however, on my return journey, I saw a considerable number of cases in the Shuli district, at an altitude of from 3,000 to 4,000 feet, where malaria is very rare; and where I may mention in passing, I think that Europeans could colonise. Again, in travelling through the Bahr-el-

Ghazal district, I saw a considerable number of phthisical individuals, not inhabitants of that province, but men and women, soldiers or slaves, who had come from the elevated districts in the Mombuttu country. Further north, at Dara, I again met with phthisis in people who inhabited the highlands of the Gebel-Marah region, where, I was informed, malarial fevers were entirely absent.

During the last few years (it may, of course, be the result of accident) I have had the opportunity of seeing several patients distinctly phthisical, in the early stages of the disease, who have since been abroad, and suffered more or less from malaria. On seeing them after their return, I found, to my surprise, that in seven out of nine, all the phthisical symptoms had disappeared, and in the other two, although I could find no improvement in their condition, the disease had apparently made no progress.

M. Boudin, in 1857, put forward the theory that malaria and phthisis were antagonistic. He held (*a*) that where malarial endemic fevers are prevalent, phthisis is rare, "that the frequency of one class of cases is inversely proportionate to that of the other." (*b.*) That where malaria decreases phthisis increases; and (*c.*) that phthisis is more curable in malarious regions than in others. These propositions were at the time vigorously discussed, but the subject has fallen out of mind. Long before M. Boudin called attention to it, in 1841, Harrison, of Horncastle, remarked on the infrequency of consumption in the fens, and in 1811, Wells contended that consumption and malaria were opposed to each other, and referred to many authorities to coroborate his statements. The references to the literature on this subject will be found in the British and Foreign Medical Chirurgical Review, vol. 23, 1859. The late Dr. T. B. Peacock, writing on the subject in 1858, did not think that any such antagonism could be proved, and published six cases which he had himself treated in which phthisis and malaria both affected the patient. Still he writes thus: "I cannot, therefore, but "conclude that it is not probable any material antagonism exists "between phthisis and intermittent fever. The facts do not, however, "warrant the denial of the supposition altogether, and there are "probably few popular ideas which have not some foundation in "truth."

It is only fair to mention that Dr. Peter Gowan, once physician to the King of Siam, does not credit the antagonism of ague and phthisis, owing to the prevalence of both diseases in Siam. (Consumption.—P. Gowan, M.D., London, 1878, pp. 57–59.) Still, he admits that "it "(consumption) was unquestionably shown to be almost, if not quite, "absent from many such localities, and to be less prevalent where the "fever was of a bad and obstinate kind."

In Corea, ague, which is there called "hakuchu," is universally prevalent, although the country is generally dry, and there are few marshes or swamps. Phthisis is almost unknown.

Professor Virchow found that nearly the whole of the population of Upper Silesia suffered from malaria, and had enlarged spleens. He never saw a case of phthisis in that region, and the doctors resident there assured him that that was the result of their experience also.

Gowan says that in all cases of phthisis he saw in patients who had also an enlarged spleen, the right lung was affected, illustrating Dr. Brehmer's theory of the causation of phthisis, and he says: "In the "enlarged spleen of those who have suffered from obstinate ague we "have a sufficient explanation of their comparative immunity from "phthisis by the accelerating influences it exercises on the circulation "within the lungs, as a result of the intermittent compression to which "the bases of the lungs are subjected by this in common with all other "enlargements of the contents of the abdomen." There is doubtless much to be said for the enlargement of the spleen acting thus mechanically, but, to my mind, it is an insufficient explanation of the whole matter, for the spleen is not invariably enlarged enough to act in that way.

I thought that I should have found something to support my view that malaria and phthisis are antagonistic, in investigating the results which have been obtained in the rearing of monkeys in this country, but, although I find that it is true the majority of monkeys do die of phthisis, yet it must be admitted that those monkeys which died at the Zoological Gardens some years ago died from the effects of imperfect ventilation, and therefore it is impossible to class them among the deaths from phthisis proper.

In referring to the annual loss by phthisis in the army, it was in 1856 8·9 per 1,000 in the line regiments in the United Kingdom; in the Guards it was 12·5, but if we look at the mortality in Malta for the same regiments during the same time, we find it was below 5 per 1,000, and that during the same time at Mauritius and Ceylon it was only 4 per 1,000, and in the Madras Presidency below 1 per 1,000.

Numbers of observers in America have called attention to the antagonism between ague and consumption. Thus, for instance, Dr. Green, of Whitehall, Washington, U.S.A., said as long ago as 1858 that, though intermittent fever was of unusual frequency in that district, there was not one case of phthisis developed there, and that phthisical patients who arrived there found "relief as decided as it was permanent." He mentions also a morass near Rutland which was made into a pool, the result being that intermittent fever disappeared, and that phthisis took its place. This was the more remarkable because the re-establishment of the morass was followed by the reappearance of ague and a diminution of phthisis; indeed, it only took a half year to establish this change. (Half-yearly Abstract of Medical Science. Vol. XXVII., 1858, p. 37.)

In a work published in Paris in 1861 "Du Mexique au point de vue de son influence sur la vie de l'homme," the author, M. Jourdanet, mentions two provinces—Yucatan and Tabasco. The former is free from malaria, but the population is decimated by phthisis. In the latter province, where severe forms of malaria are met with phthisis is rarely if ever seen, indeed so recognised is this fact, that phthisical patients are regularly sent to Tabasco from Yucatan with great benefit.

Prosper de Pietra-Santa, M.D., published a report on the climate of Algiers in reference to the chronic affections of the chest. He refers in it to the immunity which the Arab enjoys from phthisis, attibuting this to his free nomadic life, and contrasting it with the high mortality seen

in slaves. So high is the death-rate and so well recognised is the fact that slaves are steadily annihilated by phthisis, that the Arabs have a special name for it—meureth el abide—or the slaves' disease. But de Pietra-Santa is not successful in refuting the idea that malaria and phthisis are antagonistic, although he says that " out of 789 deaths in the " prison of El-Harnach 19 were from marsh miasma or other noxious " influences, 91 arose from low or typhoid fever, and 57 from phthisis." The deaths of slaves from phthisis referred to by this author are interesting, and, I think, show that, by moving from malarious regions, they are apt to succumb to consumption, and when one remembers the fatigues of a slave route it is little wonder that the debilitated creatures should fall victims to phthisis.

It is rather remarkable to note that phthisis is rare in Senegal, Benguela, Angola, and the East Indies, malaria being very rife. In Australia, Tasmania, and New Zealand phthisis is one of the five most usual diseases, malaria being never found. Again, we find that phthisis is almost absolutely wanting in Algiers, Egypt, Syria, and the steppes of the Kirchiz, whereas in Nubia, Chili, and Lima phthisis is very frequent, and we cannot help feeling sure that neither temperature, atmospheric moisture, nor geographical position explain this. We cannot understand, however, why malaria is so frequent in Ceylon and the Mauritius.

Dr. A. Hunter, late Colonial Surgeon of British Honduras, says that " Phthisis does not seem to originate in any degree in the colony, " but very frequently cases of this disease are sent to our public hospital " from some neighbouring State. Some instances of this affection seem " to derive the greatest benefit from a stay in the colony; all the more " violent symptoms subside, strength is regained, and a life that in other " countries would have been of short duration has been prolonged and a " good old age arrived at." Belize, where the hospital is situated, has a mean annual temperature of 79° F. (1890), highest, 91° F.; lowest, 56° F. Mean humidity 85, highest 90. 75 inches of rain fell on 157 days. The town is surrounded by swampy land covered with dense mango bush, and both intermittent and remittent fevers are very frequent, though by no means of a severe character. In 1890, 69 cases of intermittent fever with no deaths, and nine cases of remittent fever with two deaths, were treated in the hospital, but this by no means represents the number of cases occurring; they were very numerous, but not so severe as to require hospital attention.

I wrote to Dr. Haviland, so well known for his researches into the geographical distribution of disease in England, for information respecting this subject, and I may quote an abstract from his courteous reply. He says: " Lincolnshire has a low mortality from phthisis " among females, and forms an exception to the general rule, which at " present seems hidden in obscurity. We must, however, remember " that ague is prevalent in this part of England, and it is said that this " disease is seldom associated with consumption. A more important " coincident fact is the one that the greater portion of this land has been " reclaimed from the sea. It is well known that many sites, although " damp with sea water, enjoy a remarkably low mortality from phthisis " . . . . Again, if you look along the once ague districts of

"the north coast of Kent, you will see the whole length of it characterised "by low mortality from phthisis among females, although much exposed "to strong winds. So far, then, as I can see, from the few instances "quoted, there appears to be no marked increase of phthisis in the districts "named as once characterised by ague, but it does appear that in such "localities phthisis is less prevalent than in other districts, although these "may be exposed to the full force of the strong winds found to be so fatal "to the consumptive elsewhere. This involves the question—'Are there "'as many consumptives to kill in these malarial localities, and if there "'are not, why not?'"

There is much need for this question to be answered, and for further efforts to be made to elucidate the nature of the relation of phthisis and malaria. I have brought the subject forward because I think that it deserves more attention than t has received, for if there is an antagonism between these two diseases, the knowledge of the fact will undoubtedly be of use.

DISCUSSION.

Inspector-General Lawson said he had been nearly seven years on the West Coast of Africa, but that he had met with the black-water, as it is called, in two cases only, both mild, neither fatal. There has been a great change in the severity of malarial fever among Europeans of late years; formerly when the men-of-war sent their boats up the river the crews suffered very much from remittent, it being common for two or three deaths to take place in every ten cases; but in the last few years, with a number of attacks not less than formerly, instead of two or three deaths in ten, there are scarcely so many in a hundred attacks. Whether the frequency of black-water in the fens of the interior has been subjected to one of those changes which present themselves elsewhere, like the amelioration in their severity on the coast, remained for future experience to decide.

As to the antagonism between malaria and phthisis, the first series of statistical reports on the health of the lung abroad, embracing a period from 1817 to 1836, were published about 50 years ago. These he had examined carefully to ascertain why phthisis seemed to be distributed in so unexpected a manner. It was found that at the Cape of Good Hope, Malta, Canada, and elsewhere the ratio of deaths from phthisis to those from inflammatory affections of the lungs was pretty constant; but at Gibraltar, where salt provisions were issued three days a week, the ratio rose considerably, and at Bermuda and in the West Indies they amounted to far less, and the deaths from phthisis were given as numerous relatively to those from inflammation. With reference to malaria, groups of those stations where the mortality from malarial fever was smaller, show a smaller ratio of deaths from phthisis relatively to those from inflammatory affections than groups where the mortality from the fever was greater, though the total deaths from malaria at each might unequally differ. These results, being derived from twenty years' experience at each place, were really of considerable weight.

Friday, 14th August 1891.

The Chair was successively occupied by :—
The President, Sir Joseph Fayrer, K.C.S.I., M.D., F.R.S. ;
Surgeon-General Cornish, C.I.E., (London) ;
Edward Seaton, M.D., (London) ;
Walter Dickson, M.D., R.N., (London).

The Hospital and Ambulance Organisation of the Metropolitan Asylums Board for the Removal and Isolation of cases of Infectious Disease.

BY

Deputy Surgeon-General Bostock, C.B., and Sir Vincent K. Barrington, Delegates of the Metropolitan Asylums Board.

The rapid removal and isolation of cases of infectious disease in populous cities plays so important a part in "preventive medicine" that it is considered that an account of the work done in this direction by the Metropolitan Asylums Board will be an appropriate and interesting subject for the consideration of this section of the Congress.

Before proceeding to describe the gradual development of the hospital and ambulance systems organised by the managers of the Board for dealing with infectious disease in London, it will be desirable to refer briefly to the conditions which obtained before the Board of Management was created.

Prior to the year 1867 organised provision for the removal and isolation of infectious disease in the Metropolis can hardly be said to have existed, at least as a means of prevention. It was the duty of the boards of guardians to provide accommodation for the sick poor belonging to their respective parishes or unions, and the local sanitary authorities were empowered by law to provide similar accommodation for infectious cases other than paupers, but little was really done, and there was no central authority to organise and control any such provision.

The London Fever Hospital, at Islington, and the Small-pox Hospital, at Highgate, were the only hospitals specially devoted to the reception of these cases in the Metropolis. Both these are private institutions, supported by voluntary contributions, and are intended to receive paying patients of the middle class. During epidemics of typhus fever, a limited number of pauper patients were admitted into the fever hospital from the different parishes, but there was no hospital set apart for the reception and treatment of the pauper class, the class which owing to the crowded and insanitary condition of their surroundings, especially require prompt removal and isolation to prevent the spread of disease. All cases that could not be received into the hospitals above-mentioned were treated in the workhouse infirmaries, to a limited extent in the general hospitals, or in their own homes.

The evils attending this unsatisfactory state are obvious, and were brought to the notice of the Poor Law Board, who, in 1866, instituted an inquiry into the "condition of the infirmaries and sick wards of the metropolitan workhouses and their arrangements." As a result of this inquiry, the Poor Law Board obtained, by the Metropolitan Poor Act of 1867, power to combine into districts, the parishes and unions of the Metropolis for the purpose of providing "asylums for the reception and relief of the sick poor," and, in further pursuance of the power thus conferred upon them, the Poor Law Board issued an order combining the parishes and unions into one district, called the "Metropolitan Asylums District," for "the reception and relief of poor persons infected "with, or suffering from, fever or the disease of small-pox, or who "may be insane."

The board of management consisted of 60 members, of whom 45 were *elected* to represent the 30 parishes and unions of London, and 15 were *nominated* by the Poor Law Board, now called the "Local Government Board." These numbers have been recently increased to 54 *elected* and 18 *nominated* managers, giving a total of 72. The Board held their first meeting in June, 1867, and their first duty was to decide what hospital accommodation it was necessary to provide for the poor suffering from fever and small-pox.

It is not proposed to deal with that part of the work of the Asylums Board which concerns the management of the insane, it being foreign to the subject of this paper.

The area of the metropolitan district in 1869 was 118 square miles, and the population estimated at 3,029,135. In 1871 it had increased to 3,254,260.

To provide for the pauper part of this population, the managers were advised that it would be requisite to construct two permanent fever hospitals, containing 200 beds each, and two permanent small-pox hospitals, containing 100 beds each, and to secure an additional site on which temporary accommodation could, on an emergency, be erected. They accordingly secured sites for the permanent hospitals at Homerton and Stockwell, designated the "Eastern" and the "South-Western" hospitals on the map. Each site to hold a fever and a small-pox hospital. They also secured a site at Hampstead, the "North-Western" hospital on the map. These sites were conveniently situated for the reception of patients from all parts of the district.

Early in 1870, before the permanent hospitals were completed, the managers were called upon to provide accommodation for cases of relapsing fever, which had become prevalent in the eastern districts of London. This was done by erecting temporary wooden huts on the grounds of the London Fever Hospital at Islington, and on the newly-acquired site at Hampstead.

At the close of the year (1870) the first cases of what became the most formidable epidemic of small-pox occurred; and the development and extension of the hospital and ambulance systems of the Asylums Board has been mainly due to the experience gained during this and the succeeding epidemics of small-pox, which followed each other with

short intervals, until 1885, and during which 56,952 patients were admitted into the managers' hospitals.

At first, all patients were supposed to be of the pauper class, but it soon became evident that a large proportion of them were not of the class who, under ordinary circumstances, would avail themselves of parochial relief. In the managers' view, greatly increased provision would have to be made for the artizan class, as well as for others superior in social position, who sought admission into the hospitals, as they could not be safely isolated or efficiently nursed at their own homes.

This view was confirmed by the representations of many of the public sanitary authorities, who pointed out the urgent necessity of making the hospitals available for other than pauper patients. They argued that, as a central authority for dealing with infectious disease amongst one class of the community was already supported out of the rates, an extension of its powers to enable it to deal with all classes would be more favourable to the sanitary and financial interests of the Metropolis than could be expected from any action taken by the local authorities themselves.

To meet the demand thus made on their resources, the managers hastened the completion of the four permanent hospitals at Homerton and Stockwell, the site at Hampstead was utilised to its utmost extent, and the Hospital Ship "Dreadnought," moored off Greenwich, was acquired and used for convalescent patients. Subsequently, two additional sites were purchased at Deptford and Fulham, named the "South-Eastern" and "Western" hospitals on the map, and rapidly covered with hospital buildings. A camp of hospital tents was also established for convalescent small-pox patients, on some land near Darenth, in Kent, adjoining one of the managers' asylums for imbeciles, to which patients were transferred by an organised system of road conveyance.

The Regulations of the Local Government Board, made under the Act of 1867, provided that every patient should be admitted to hospital upon the order of a relieving officer, accompanied by a certificate signed by a district medical officer.

These regulations had always been found difficult to comply with, and when the hospitals were opened to other classes than paupers, and the ambulance system of the managers was extended to the whole Metropolis, they were found to be absolutely impracticable. Considering the great importance of prompt action in cases of infectious disease, it was found necessary to allow patients to be removed upon the receipt of information, by telegram or otherwise, from any Poor Law official, on condition that the prescribed "admission order" was subsequently sent to the medical superintendent of the hospital into which the patient was admitted.

At a later stage it becoming obvious that it was hopeless to cope with a serious epidemic as long as the admission to hospital was hampered by *any* restriction, the managers sanctioned the removal of all patients to their hospitals on the simple application of the sanitary authorities of the Metropolis. In order, however, to protect themselves against the risk which would be incurred by admitting into an infectious

hospital patients who were found not to be suffering from an infectious disease, it was directed that no patient should be removed unless a medical certificate was handed to the ambulance nurse. This certificate continues to be, in all cases, indispensable, and as no patient can be removed without a medical examination, no delay ought to be occasioned by insisting on its production.

In order to remove any doubt as to their legal position, and being thoroughly convinced that in the interest of the public health, no delay should take place in the removal and isolation of infectious cases, the managers applied to the Local Government Board for authority to remove all cases of persons suffering from small-pox or fever, whose removal was applied for by any " duly qualified medical practitioner."

The Local Government Board not being able to obtain immediate legislation, but anxious to assist the managers, issued an order in 1887 which permitted the certificate of any "registered medical practitioner" to accompany the relieving officer's order. This concession, small as it was, appeared to have a salutary effect, as the admissions for fever during the latter half of the year were nearly four times greater than in any preceding year. In August 1889, an Act was passed by which the managers were empowered " subject to such regulations and restrictions as the Local Government Board from time to time make," to admit into their hospitals any person who is not a pauper, and is "reasonably believed to be suffering from fever, small-pox, or diphtheria."

From this time the managers have complied with the application of *any* person, provided that it is accompanied by a medical certificate, which must be handed to the ambulance nurse. The names and addresses of the patients are sent to the clerk of the guardians of the parishes or unions to which they belong and to which the expenses of their maintenance when in hospital will be charged, and the Act empowers the guardians to recover the same as a simple contract debt. For pauper cases, a " relieving officer's " order is still required; but in order to avoid any delay in removing the case, the order may be given *after* the patient has been received into hospital.

During each of the small-pox epidemics referred to, serious allegations were made as to the malignant influence of the hospitals on the surrounding neighbourhoods. The persistent outbreaks of the disease were ascribed by many sanitarians to the aggregation of large numbers of small-pox patients in hospitals situated in populous districts; and actions at law were brought against the managers to compel them to close their hospitals.

One of the inspectors of the Local Government Board was directed to hold an inquiry into the incidence of small-pox in the vicinity of the Western Hospital. It appeared to be conclusively shown that when small-pox cases were freely admitted into the hospital, the number of houses invaded in a special area, within a mile radius round the hospital, was four times greater than in other parts of the adjoining districts, and that, in the special area itself, a regular and progressive increase of invasion existed as the centre of infection—the hospital—was approached.

In 1881 a Royal Commission was appointed to consider the "Conditions and Limitations under which the Hospitals provided by the Managers should be continued."

Their Report was presented to Parliament in 1882, and the following were among the practical recommendations made therein :—

1. The provision of hospital accommodation for infectious disease should be entirely disconnected from the Poor Law, and be treated as part of the sanitary arrangements of the Metropolis.
2. Cases of infectious disease should be notified to the medical officer of health of the district in which the patient resides.
3. The hospitals hitherto used for small-pox should, in the main, become fever hospitals, and small-pox should be treated in hospitals established in isolated situations on the banks of the Thames, or in floating hospitals on the river itself.
4. It was also suggested that convalescent hospitals for infectious cases should be established at some distance in the country.

One of the first results of the report was the removal of all *civil disabilities* which were attached to admission into the managers' hospitals. The stigma of pauperism was removed.

Another result was the removal of the hospital ships "Atlas" and "Endymion," which had replaced the old "Dreadnought," from their moorings off Greenwich to an isolated position in Long Reach, 15 miles below London Bridge. At the same time the twin-vessel "Castalia" was purchased, re-constructed as a hospital, and moored astern of the "Endymion." Land was also purchased opposite the ships, on which was built a laundry, extra sleeping accommodation for nurses, and a house to contain the engines and dynamos for electric lighting.

Subsequently the floating hospital was supplemented by a permanent hospital for convalescents on the hill side at Gore Farm, near the asylum at Darenth, where the temporary tent camp had previously existed; specially constructed steamers were built to convey patients from London, and wharves, two on the north and one on the south side of the river in London, were constructed to facilitate their embarkation.

For some years attention had been drawn to the danger to the community likely to arise from the conveyance of persons suffering from infectious disease in public conveyances; and in 1886 the matter was brought prominently before the managers by the Commissioner of Police, who applied to them to undertake the disinfection of public carriages that had been so used.

This the managers declined to do, on the ground that, owing to the furniture of these carriages, complete disinfection is impossible, and that by attempting it, encouragement would be given to a practice which they considered to be most objectionable; but they made a representation to the Local Government Board and obtained from them, by the Act of 1889, authority to remove, in their ambulances, persons suffering from infectious disorders to other places than their hospitals. The disorders include small-pox, cholera, diphtheria, membranous croup, erysipelas,

scarlatina or scarlet fever, typhus, typhoid, enteric, relapsing, continued, and puerperal fevers, and measles.

The following is a return of cases which have been removed to other places than the Asylums Board's hospitals, from the 16th December 1889, up to the 10th May last :—

Scarlet fever - - -	54
Enteric fever - - - -	25
Puerperal fever - - -	2
Small-pox - - - -	3
Diphtheria - - - -	19
Measles - - - -	60
Membranous croup - - -	1
Erysipelas - - - -	13
Total - -	177

During the same year (1889) an Act was passed by the Legislature, introducing into the Metropolis the system of "compulsory notification of infections diseases," which had been found to work advantageously in many large provincial towns. The Act provides that copies of the certificates received by the various medical officers of health, shall be forwarded to the managers of the Asylums Board. The information thus afforded, is tabulated and sent weekly to each medical officer of health, who is thus made acquainted with the prevalence of disease in his own and contiguous districts. The information is also of great use to the managers, as it enables them to compare the numbers admitted into hospital with the total number actually notified, and thereby to judge approximately of the extent of accommodation likely to be acquired.

This measure must also greatly facilitate the early removal of cases, and be of the greatest advantage in preventing the spread of disease in the neighbourhoods from which they are removed.

Metropolitan Asylums Board.

Return of Notifications from 30th October 1889 to the 16th May 1891.

Small-pox - - - -	134
Scarlet fever - - -	22,380
Typhus fever - - - -	58
Relapsing fever - - -	12
Diphtheria - - - -	8,833
Membranous croup - -	919
Continued fever - - -	342
Typhoid or enteric fever - -	4,422
Cholera - - - -	27
Erysipelas - - -	7,122
Puerperal fever - - -	339
Total - -	44,588

It had long been felt that the education of medical students was incomplete, as they had little opportunity of studying the diagnosis and

treatment of infectious diseases. The general hospitals in London do not, as a rule, admit sueh cases into their wards, and errors of diagnosis were of frequent oceurrenee. By the Act of 1889 the managers' hospitals are made available for clerical instruction. Students have now the opportunity of attending the practiee at the fever and small-pox hospitals of the Board, and "eertificates" are granted on the eompletion of a preseribed eourse.*

At the present time, the Metropolitan Asylums Board is plaeed by law in the position which it has practieally oceupied by force of circumstances, for several years. One by one the obstructions, due to ignorance and indifference, whieh hampered the aetion of the managers, have been swept away; and every inhabitant of London is now legally entitled, when suffering from fever, diphtheria, or small-pox, to claim admission into one or other of the managers' hospitals, or to call upon them to earry him to any other hospital or place within the metropolitan district.

Having thus briefly alluded to the successive steps whieh have led to this eonsummation, it is now proposed to set forth the existing hospital and ambulance organisation for the prevention of the spread of disease, and to describe, somewhat in detail, the proceedings in connexion with the removal of patients.

Hospitals.

The present accommodation for fever and diphtheria consists of six hospitals:—

Name of Hospital.	Position.	Acreage of Site.	Number of Beds.	Estimated Population of Districts served.
1. Eastern - -	Homerton - -	9	442	1,114,432
2. South-Eastern -	Deptford - -	11	462	941,381
3. South-Western -	Stockwell - -	8	340	582,591
4. Western - -	Fulham - -	6	224	690,158
5. North-Western -	Hampstead - -	11	435	882,514
6. Northern - -	Winchmore Hill -	36	480	—
			2,383	4,211,056

Giving one bed for every 1,767 inhabitants.

The position of these hospitals is shown on the map.† The first five are within, but on the outskirts of, the Metropolitan area, and serve the districts from which they are named. They are situated so that the average length of the journey a patient has to be carried to reach the nearest hospital does not exceed three-and-a-half miles. The sixth hospital, for convalescents, is four miles outside the northern boundary of the Metropolis.

It will not be necessary to describe the plan of these hospitals; their general arrangement will be understood from the block plans which are attaehed.‡ The Eastern, the South-Western, and the Northern

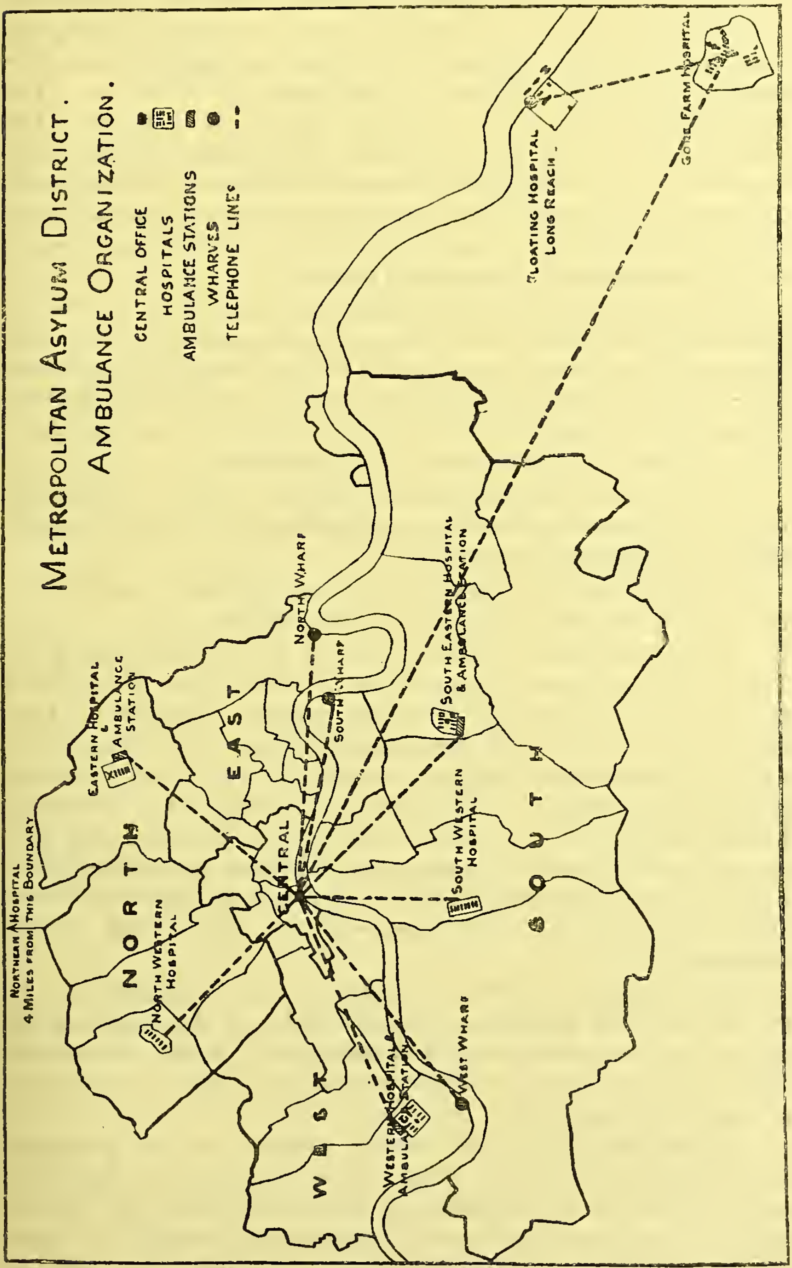
* Appendix E.

† *See* Map of London, page 267.

‡ *See* pp. 269–274.

FIG. I.

MAP OF LONDON, SHOWING THE POSITION OF THE BOARD'S FEVER AND DIPHTHERIA HOSPITALS, 1891.



North District.

St. Marylebone.
St. Pancras.
Hampstead.
Islington.
Hackney.

West District.

Kensington.
Fulham.
Paddington.
Chelsea.
St. George's.
Westminster.

South District.

St. Saviour's.
St. Olaves.
Lambeth.
Wandsworth and Clapham.
Camberwell.
Greenwich.
Woolwich.
Lewisham.

Central District.

St. Giles and St. George.
Strand.
Holborn.
City of London.
Port of London.

East District.

Shoreditch.
Bethnal Green.
Whitechapel.
St. George-in-the-East.
Stepney.
Mile End Old Town.
Poplar.

are two-storied buildings in permanent material. The South-Eastern, the Western, and the North-Western are of one storey, and are constructed partly of brick and partly of wood and iron. They are all on the pavilion system, with cross ventilation. Separate pavilions are allotted to each disease, and each bed in the five London Hospitals, into which patients in the acute stage of the disease are admitted, has a floor space of 144 square feet and a cubic space of 2,000 feet. The ventilation, drainage, water supply and lighting are efficient. The wards are heated by open fire places supplemented by hot water circulation. The administrative department is detached from the wards, and contains a residence for the medical superintendent, apartments for the other chief officers, and ample accommodation for the large staff of nurses, laundry women, servants, and porters.

During 1886–7, the accommodation was found to be insufficient, particularly in the Eastern and Western districts, and steps have been taken to establish an additional hospital for 400 beds in the north-east districts, and to increase the number of beds at the Western Hospital to 400. This will give a total number of beds for fever and diphtheria cases of 2,959, or one bed for every 1,423 inhabitants.

It may also be found necessary to establish a second convalescent hospital for the south of London, corresponding with that at Winchmore Hill for the northern districts.

The total number of cases of fever and diphtheria admitted into the hospitals from 1870 to the end of 1890 is 55,204.

The accommodation for small-pox is the Floating Hospital on the Thames, at Long Reach, 15 miles below London Bridge.* It consists of the "Atlas," the "Endymion," and the twin-ship "Castalia." They are moored in a line 150 yards from the bank; the "Endymion," used for administrative purposes, between the two other ships with communicating bridges. The "Atlas" is a 90-gun ship, capable of holding 200 beds in the main, lower, and orlop decks, together with isolation wards erected on the upper deck. Patients are admitted to the reception room on the orlop deck, and are raised by a lift to the decks above. In this ship are the quarters of the medical staff and the dispensary.

The "Endymion," a 50-gun frigate, contains the administration of the hospital. The kitchen is on the main deck, and the mess rooms for the staff on the deck below, with stores, &c. It also contains the quarters of the steward the matron and the male staff, as well as those of some of the female staff.

The "Castalia,"† an iron twin-ship, formerly conveyed passengers between Dover and Calais. The engines were removed from both ships, as well as the paddle-wheels which revolved in the channel between them, and the interval decked over, forming an upper and lower hospital. The iron girders, eight feet high, which hold the ships together, divide the lower deck into five wards; and on the platform

* *See* plan of Floating Hospital, p. 275.

† *See* plan of the hospital decks of the "Castalia," with side elevation, p. 277.

Fig. II.

METROPOLITAN ASYLUMS BOARD.

Block Plan of Eastern Hospital, Homerton, for Fever and Diphtheria, 442 Beds.

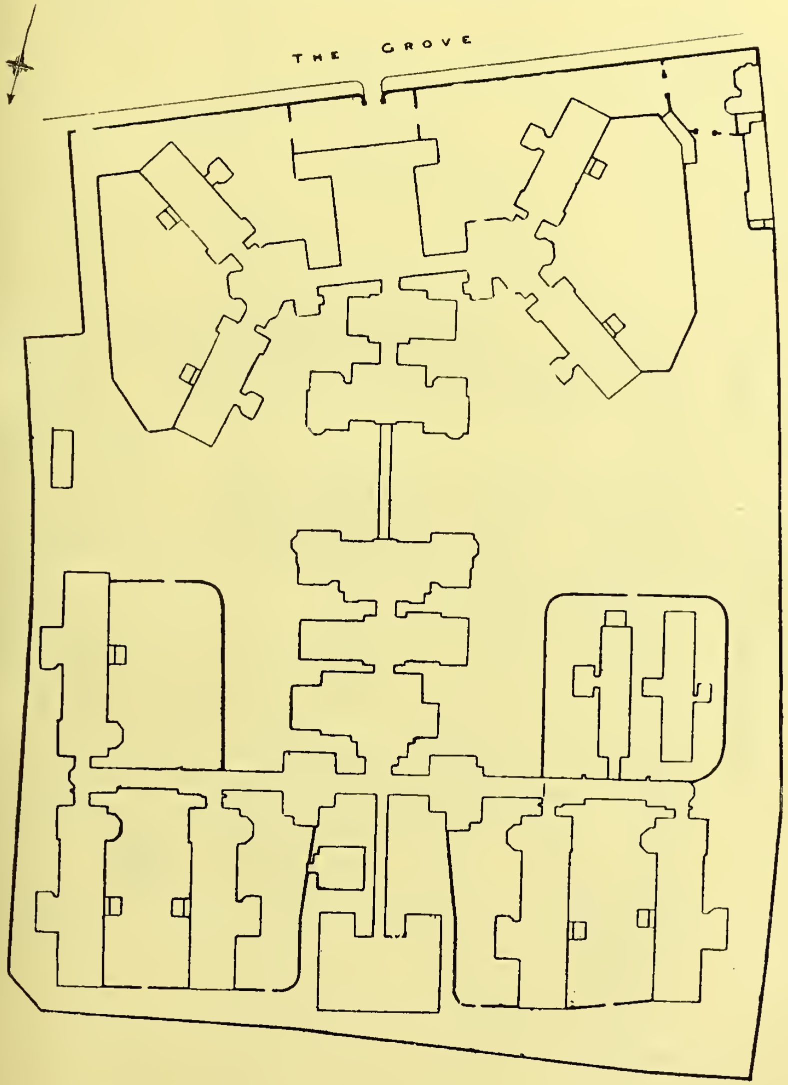


Fig. III.

METROPOLITAN ASYLUM DISTRICT.

South-Eastern Hospital. 462 Beds. Fever and Diphtheria.

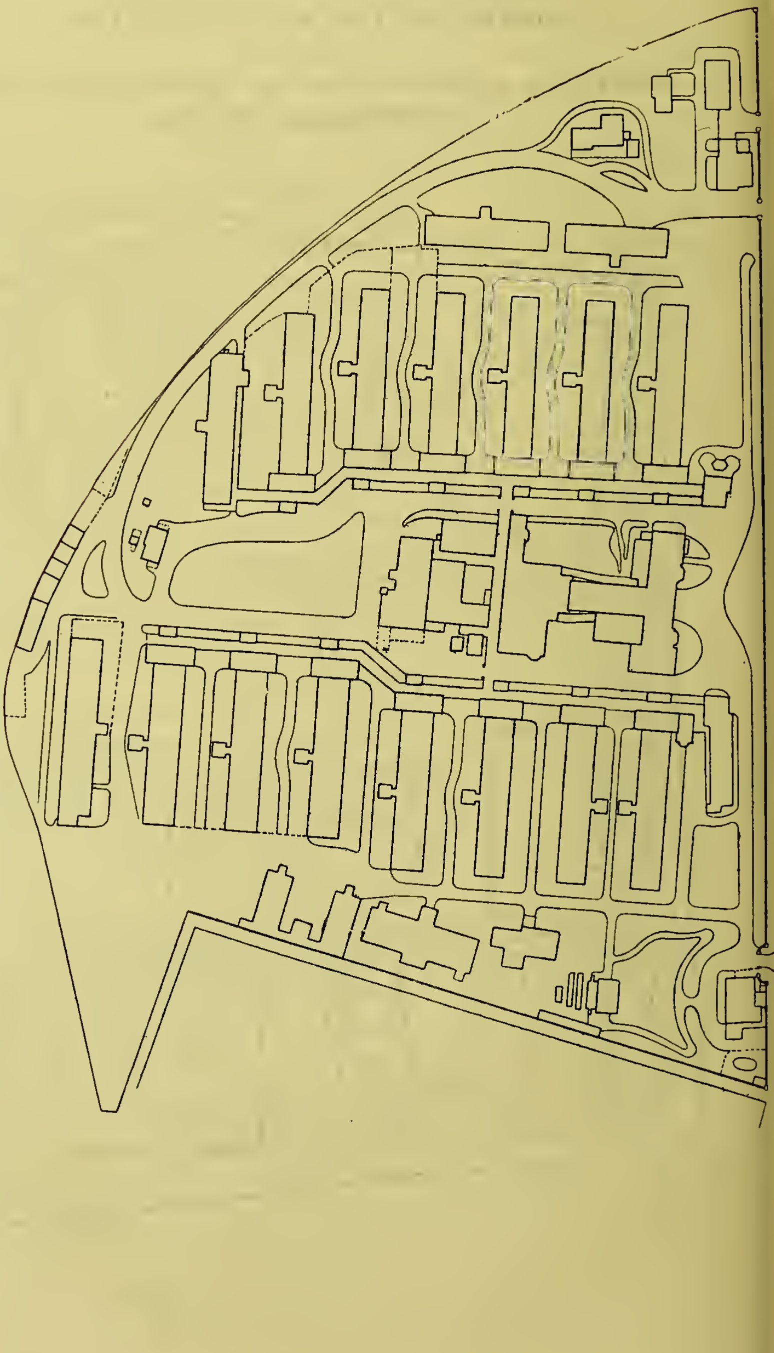


FIG. IV.

METROPOLITAN ASYLUM DISTRICT.

SOUTH-WESTERN HOSPITAL. 340 BEDS. FEVER AND DIPHTHERIA.

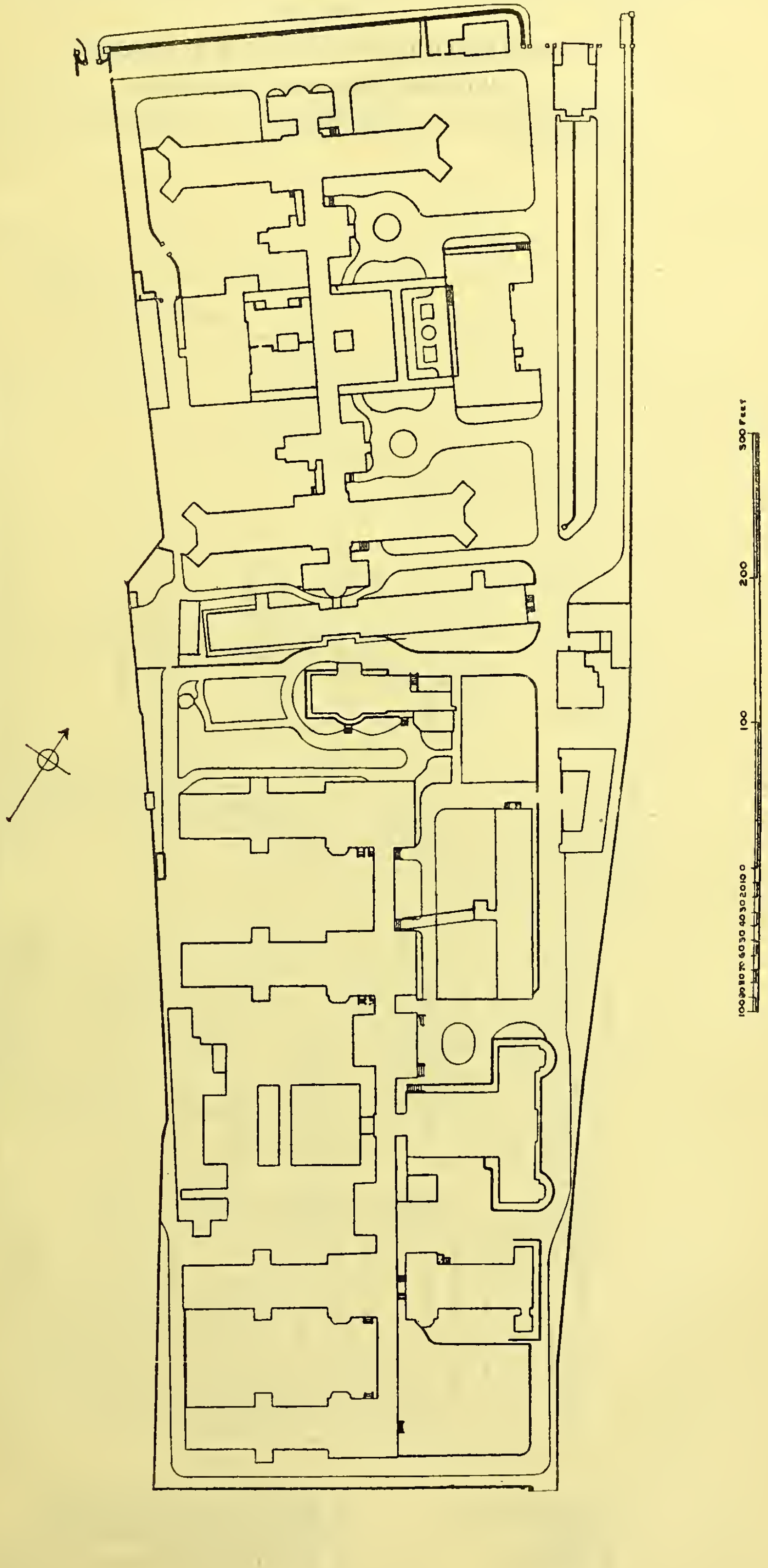
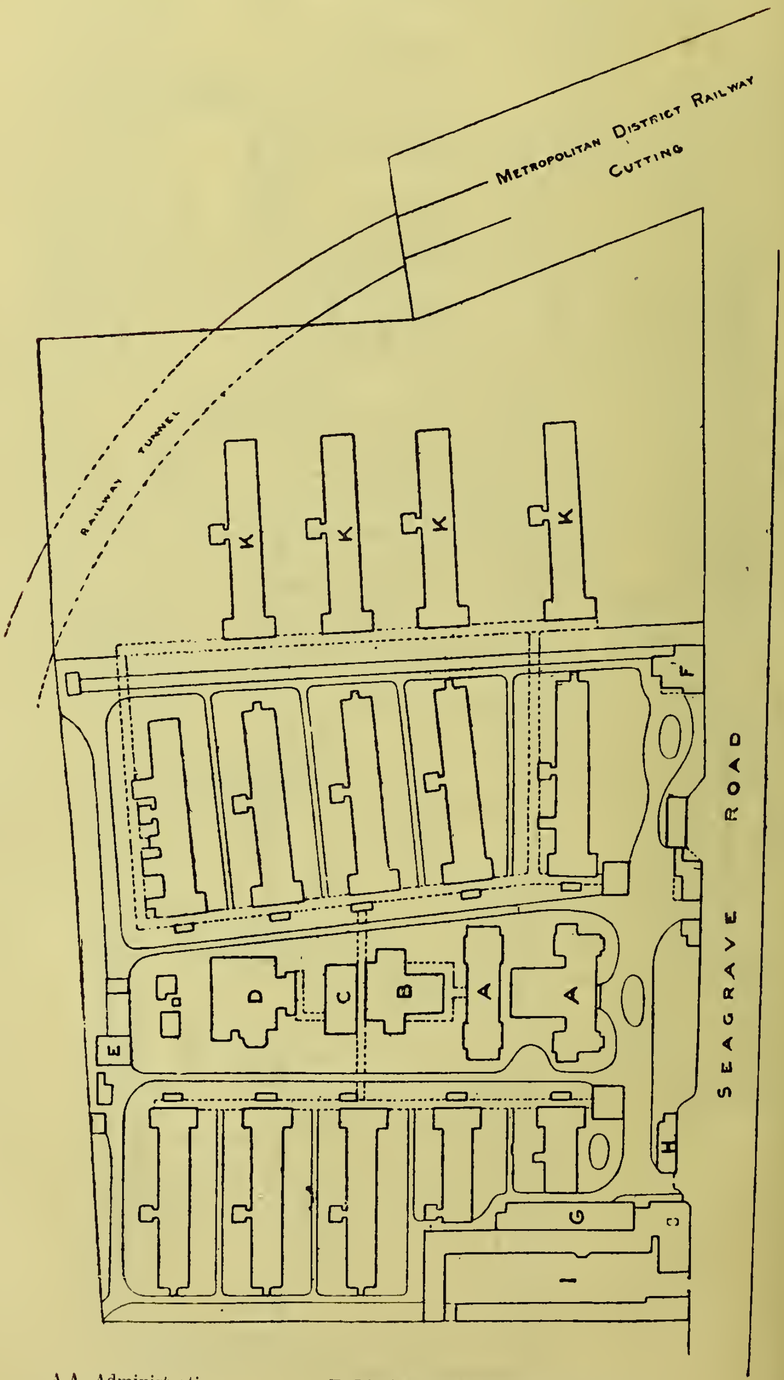


FIG. V.

METROPOLITAN ASYLUM DISTRICT.

WESTERN HOSPITAL.—SITE PLAN.

224 Beds, Fever and Diphtheria, to be increased to 400.



A.A. Administration.
B. Kitchen.
C. Stores.
D. Laundry.
E. Destructor.
F. Medical Superintendent's House.
G. Nurses' Bath and Dressing Rooms.
H. Clinical Students' Dressing Room.
I. Ambulance Station.
K. Proposed Additional Wards for 176 Beds.

FIG. VI.

METROPOLITAN ASYLUM DISTRICT.

NORTH-WESTERN HOSPITAL. 413 BEDS, FEVER AND DIPHTHERIA.

Fig. VII.

METROPOLITAN ASYLUMS BOARD.

Northern Hospital. 480 Beds. Convalescent, Fever, and Diphtheria.

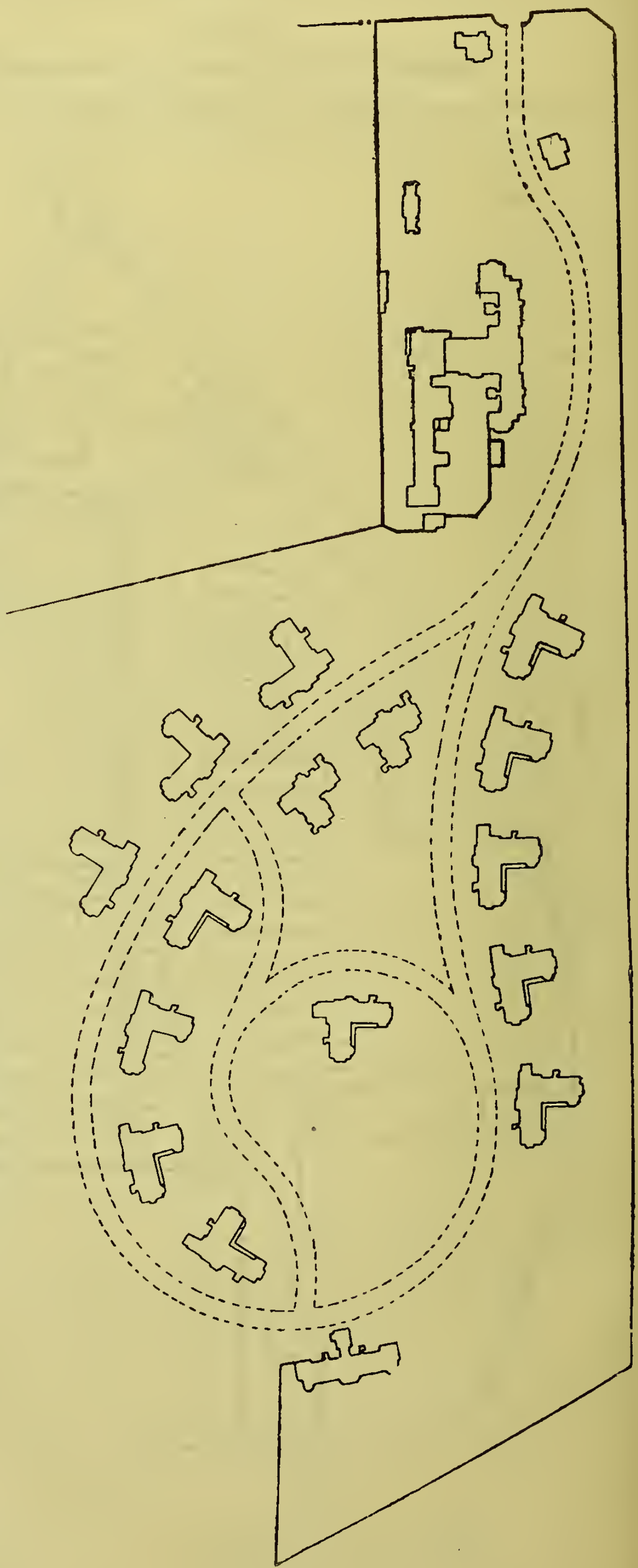
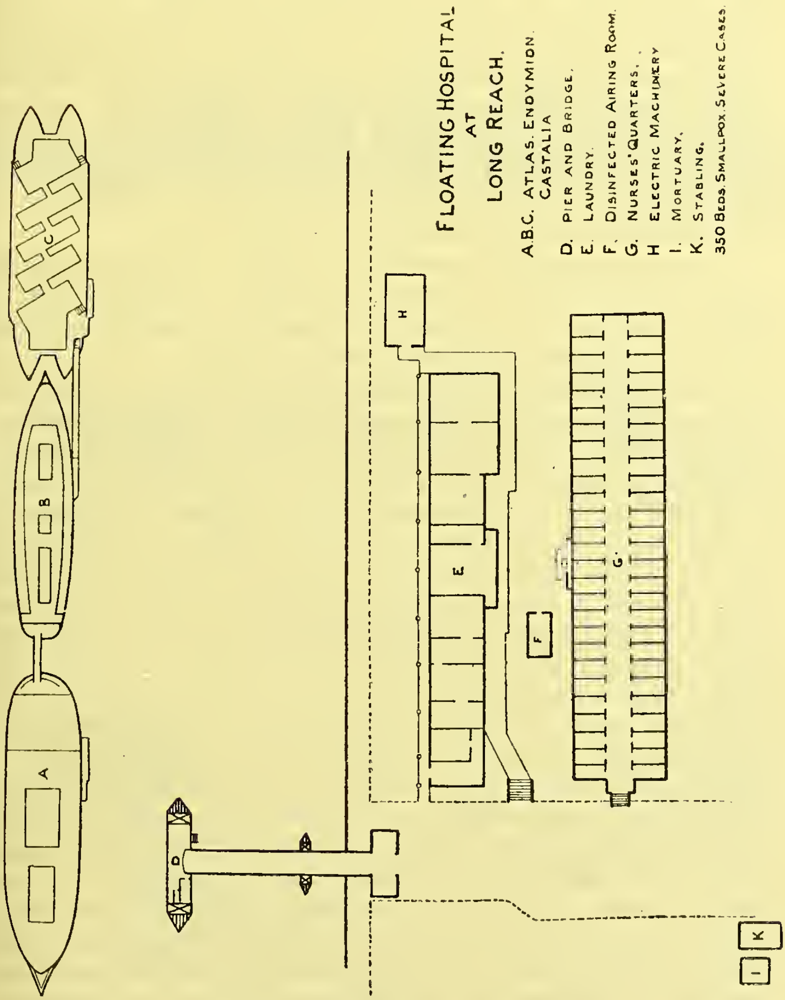


Fig. VIII.


FLOATING HOSPITAL
AT
LONG REACH.
A.B.C. ATLAS. ENDYMION. CASTALIA
D. PIER AND BRIDGE.
E. LAUNDRY.
F. DISINFECTED AIRING ROOM.
G. NURSES' QUARTERS.
H ELECTRIC MACHINERY
I. MORTUARY.
K. STABLING.
350 BEDS. SMALLPOX. SEVERE CASES.
A
B
C
D
E
F
G
H
I
K

constructed above, five wards, placed *en échelon*, were built, with a reception room, isolation wards, baths, lavatories, and latrines. She holds 84 beds in the lower and 70 in the upper hospital, a total of 154 beds.

The three ships are warmed by steam, at a pressure of 30 pounds, generated in the hold of the "Endymion" and conducted by flexible piping to the "Atlas" and "Castalia." On the "Atlas," coils are placed down the centre of each deck, and on the "Endymion," coils are also placed in the mess rooms and cabins, where necessary, but on the "Castalia," the steam pipes are carried round the floor of each ward and lavatory. They are enclosed in an iron casing communicating with inlets for fresh air, which can be regulated at will, and with the wards through openings on the hit and miss principle. Each ship has, in addition, its own steam boiler, communicating with the heating pipes, so as to be independent of the central service in case of accident. The temperature is well maintained in all weathers. There are no fire-places or heating stoves in either of the ships.

The ventilation of the wards on the "Atlas" is by the ports on the opposite side of each deck, assisted by openings above each port, so constructed as to direct the fresh air upwards over the patients' beds. The foul air escapes through large open hatches.

In the "Castalia" the ventilation is by extraction. Opening into each ward there are two tall shafts terminating in "Boyle's" extractors. The shafts in the lower wards are 3 feet 4 inches in diameter, and 2 feet 4 inches in the upper wards. Wind blowing from any quarter creates an upward current in these shafts. In the latitude of London, the average force of the wind is from six to eight miles an hour; and on a calm day in May, when the force of the wind was about two-and-a-half miles, a series of experiments was made in the wards of the lower hospital, with the result that, (1) the current through the shafts was always upwards; (2) the current was at the rate of 150 feet per minute, with due allowance for friction; (3) the sectional area of a shaft 3 feet 4 inches in diameter is a fraction over 8 feet. More than 1,200 feet were, therefore, extracted per minute, or 72,000 per hour through each shaft, and for the two shafts more than 144,000 feet per hour; (4) the average cubic capacity of the wards is 16,000 feet, and the air is changed nine times an hour; and (5) without perceptible draught. The upper hospital wards are ventilated in the same manner. In a dead calm, a current up the shafts is artificially created by a fan, set in motion by the pumping engine, which propels air through pipes leading to the end of the shafts. During the epidemic, when the wards were occupied by confluent cases of great severity, there was no offensive smell, and the ventilation was excellent.

On shore, opposite the ships, is the laundry, a building containing sleeping accommodation, with baths and dressing rooms for the nurses and female attendants, the engines and dynamos for the electric lighting of the whole establishment, with stabling and coach-houses. There is a pier* for landing convalescent patients on their way to the hospital at

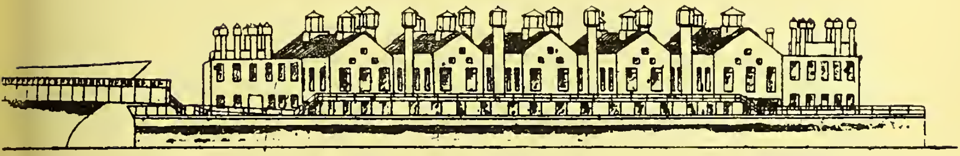
* *See* plan of Pier at Long Reach, Fig. VIII., p. 275.

FIG. IX.

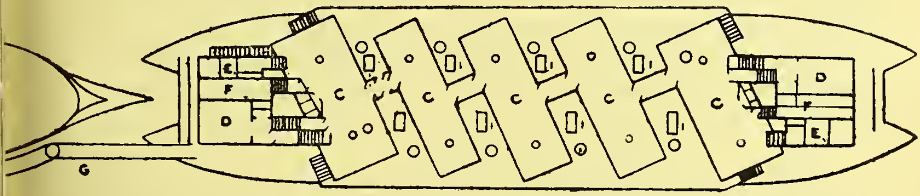
HOSPITAL SHIP "CASTALIA."

150 BEDS. SMALLPOX, SEVERE CASES.

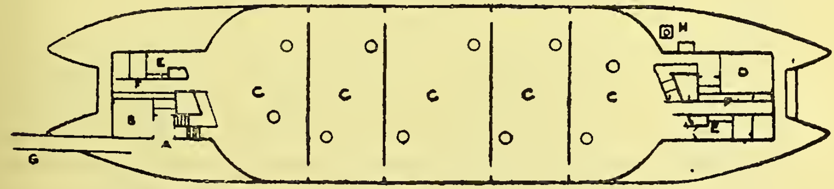
SIDE ELEVATION.



UPPER HOSPITAL



LOWER HOSPITAL



A. Entrance.
B. Receiving room.
C. Wards.
D. Isolation wards.
E. Baths and lavatories.
F. W.C.
G. Bridge from "Endymion."
H. Smoke stack from pumping engine and boiler.
I. Skylights.
○ Ventilating shafts, lower wards.
○ Ditto upper wards.

Gore Farm, and for their embarkation when recovered and on their return to London. The Convalescent hospital at Gore Farm is four miles distant from the ships. It is admirably placed on the summit of rising ground on a site of 159 acres, part of which is irrigated by the sewage of the hospital and under cultivation.* It consists of 12 two-storied pavilions for 50 beds each, placed *en échelon*, with detached administration blocks for the staff, kitchen, laundry, stores, &c. This hospital has been recently completed in permanent material. There are, in addition, eight pavilions for 26 beds each, constructed of wood and iron, which formed part of an encampment for 1,000 patients established to meet the requirements of the small-pox epidemic of 1884–5. They have been put into complete repair and are retained. The number of beds for small-pox is 350 for acute severe cases on board the ships, and 800 for mild and convalescent cases at Gore Farm: total 1,150. The administrative buildings at the new hospital are intended to serve 1,000 beds, and four additional pavilions, for 50 beds each, can be placed on the site if required.

A few beds are retained in one of the London hospitals for special cases of small-pox whose removal to the ships would be attended with danger to life, as well as to provide for the interruption of the navigation of the Thames from fog or other cause.

All the hospitals, ambulance stations, and wharves are in telephonic communication by private wire with the head office at Norfolk House.

Ambulance.

Attention had been drawn from time to time since the opening of the hospitals, to many defects in the arrangements for the removal of patients to the managers' hospitals. The duty of this removal rested on the several boards of guardians, and, as might be expected, the method adopted by these bodies differed in important details. The vehicles were in some cases the property of the guardians, in others of the vestry or district board, and in others, again, were hired for the occasion. They were defective in construction, and unsuitable for the safe transport of persons prostrate with disease. In many instances the carriages, after use, were housed in a manner most objectionable and dangerous to the public health; as, for example, where a carriage, after being used for the removal of a small-pox case, was placed in a job-master's yard, surrounded by other carriages. Frequent complaints were made of the carriages conveying patients to hospital stopping at public-houses, into which the drivers and the patient's friends went for refreshment. Moreover, difficulty was frequently experienced in obtaining a carriage when required, and the delay thus caused increased the danger of the spread of disease. Nurses to accompany the sick were seldom provided; in most cases the patients travelled alone, and occasionally reached the hospital in a dying condition. Sometimes they were accompanied by friends, not always sober, who returned home in public conveyances.

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* *See* plan of Gore Farm Hospital, Fig. X., p. 279.

Fig. X.

GORE FARM HOSPITAL, near DARENTH.

800 Beds. Small-pox Convalescents and Mild Cases.

A. Administration.
B. Male and Female Staff.
C. Male Blocks.
D. Female Blocks.
E. Bath Houses.
F. Discharging House.
G. Isolation Ward.
H. Remains of Camp.
I. Laundry.
K. Medical Superintendent's House.
L. Gas Works.
M. Water Tank.
N. Farm.
O. Land Irrigated by Sewage.

These circumstances were duly brought to the notice of the Local Government Board, and were enforced by urgent representations by the medical officers of health and sanitary authorities; notably, by Dr. Stevenson, Medical Officer of Health for Paddington, in an exhaustive report on the subject, published in 1877, who suggested that the managers should undertake the removal of the infectious sick in their own ambulances. The medical officers of health generally have never failed to assist the managers in carrying out what they proposed for the public welfare.

In consequence, the Local Government Board were induced to obtain by the Act of 1879, section 16, authority for the managers to undertake the removal of patients from their homes to the hospitals under their control.

The managers, although most anxious to undertake a work the importance and desirability of which was obvious, but which was attended by a serious responsibility, took some time to consider what steps should be taken to carry out efficiently the removal of the infectious sick of the whole Metropolis. As a tentative measure, a yard, with stabling and coach-houses, was hired at the London Fields, near Homerton, carriages suitable for the transport of patients in a recumbent position were built, and the system on a small scale, inaugurated.

At this time small-pox was epidemic in the eastern districts of the Metropolis, and cases were removed for the first time in the managers' ambulances to the Eastern Hospital, as well as from the hospital, when convalescent, to the ship "Atlas," which had replaced the old "Dreadnought," and was moored off Greenwich. No wharves had yet been completed, and a ferry was hired for the purpose of embarkation. This limited service proved a complete success, and was, by degrees, extended to the whole Metropolis. Permanent ambulance stations were built on land adjoining the Eastern, the Western, and the South-Eastern Hospitals.

At first each station was directed by the committee of management of the adjoining hospital, but as the work extended and its importance became more fully recognised, the whole ambulance system was placed under a separate authority, and in 1886 the Ambulance Committee was formed, and has taken the whole responsibility of its direction.

The ambulance arrangements may be conveniently considered under the following heads :—

1. Land Service.
2. River Service.
3. Removal and distribution of Patients.

1. *Land Service.*

Each of the stations adjoining the Eastern, the Western, and South-Eastern hospitals,* contains a house for the superintendent and housekeeper, who are man and wife; sleeping accommodation, with baths and lavatories, for the male and female staff; a kitchen, mess, and store rooms; a laundry, coachsmiths' forge, general ambulance store, and equipment room.

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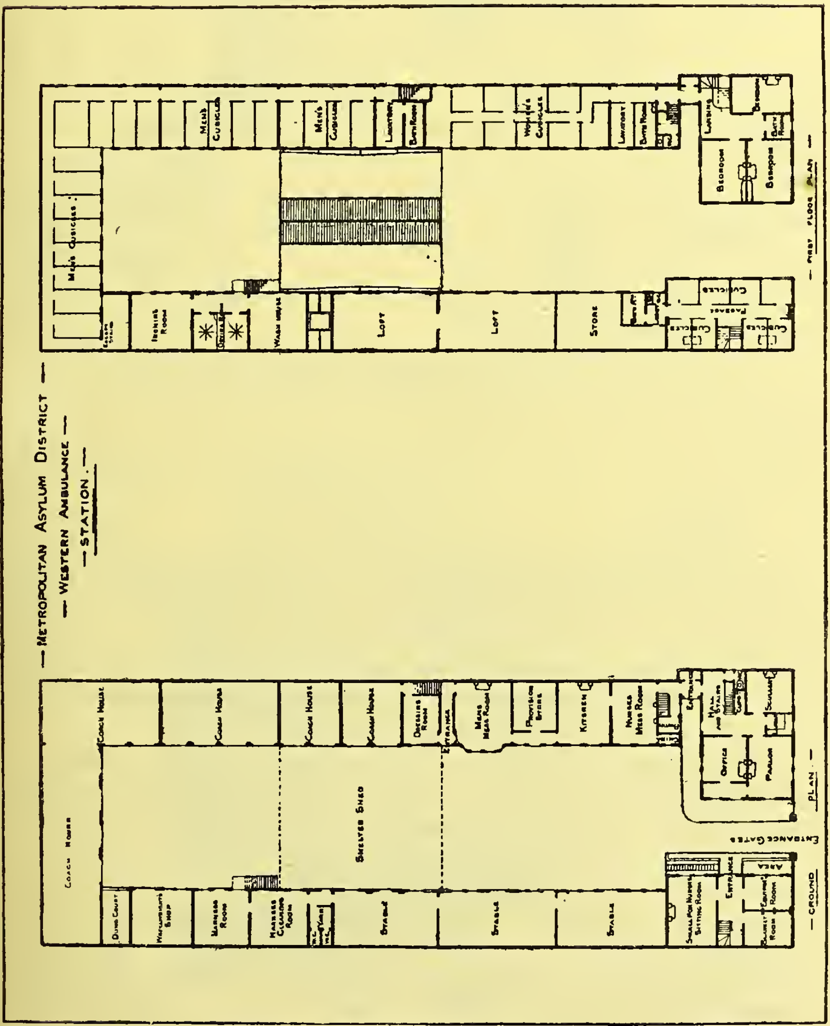
* *See* plan of Western Ambulance Station, Fig. XI., p. 281.

Fig. XI.

Plan of Western Ambulance Station.



In each there is stabling for 15 horses, capable of extension to 20 on emergency; harness rooms and coach-houses for 20 to 30 carriages, omnibuses, and an accident cart.

TABLE showing the ACCOMMODATION in each STATION.

Stations.	Superintendents.	Housekeepers.	Males. Drivers, Horse-keepers, Attendants.	Females. Laundry Women, Servants, and Small pox Nurses.	Telephone Clerk.	Horses.	Carriages.
Eastern - -	1	1	22	14	1	15	30
Western -	1	1	15	11	1	15	13
South-Eastern	1	1	20	12	1	20	25

The horses are hired by contract in numbers sufficient to meet the varying exigencies of the service.

An experienced nurse accompanies each ambulance, and a male attendant to assist the nurse in carrying the patient, when over 10 years of age, from his home and placing him in the carriage. In cases of severe illness the stretcher bed is taken into the house, and the patient is placed upon it. It is then put on to the frame which supports it in the carriage, and passed into position.

The nurses for fever cases are drawn from the staff of the adjoining hospital, a certain number of whom are told off for this duty. A nurse is always detailed ready for a "call." Restoratives and refreshment suitable for patients in a prostrate condition are provided in charge of the nurse. During the prevalence of small-pox, the nurses for ambulance duty are provided with quarters in the station, as it is desirable to keep the fever and small-pox nurses distinct and separate.

Patients are in all cases required to bring as little clothing as possible with them to hospital. They are wrapped in blankets provided for this purpose, and sent in the carriage.

The duty of disinfecting the abode of the patient, with its contents, devolves on the sanitary authorities of the district, to whom notice of the removal is immediately sent. After depositing the patient at the hospital, as directed from the ambulance office at Norfolk House, the carriage returns to its station, where it is disinfected and thoroughly cleansed, before being used again for a fresh patient. During the prevalence of small-pox, a certain number of the carriages at each station are set apart for the removal of patients suffering from this disease.

There are several types of carriage used for the ambulance service.* The accompanying drawing represents a "van" ambulance. It is very easy for the sick, and being hung low, is remarkably steady.

* *See* drawing of van ambulance, Figs. XII. and XIII. p. 283.

METROPOLITAN ASYLUM DISTRICT.

Van Ambulance for one or two Adult Patients.

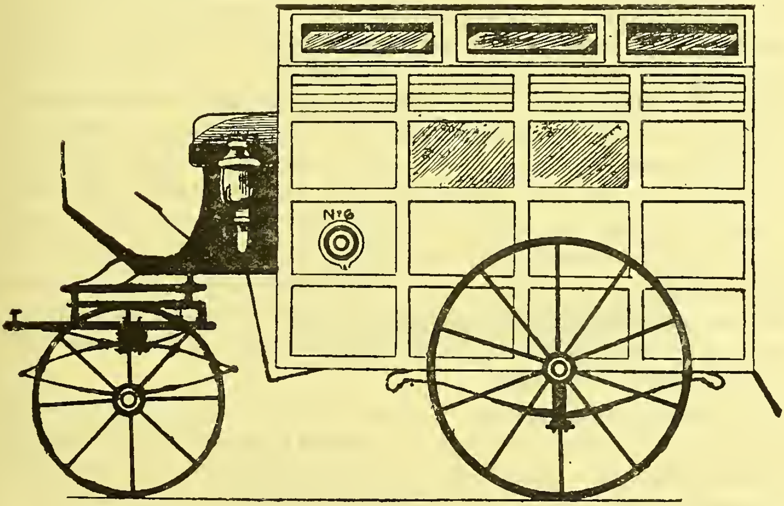


Fig. XII.

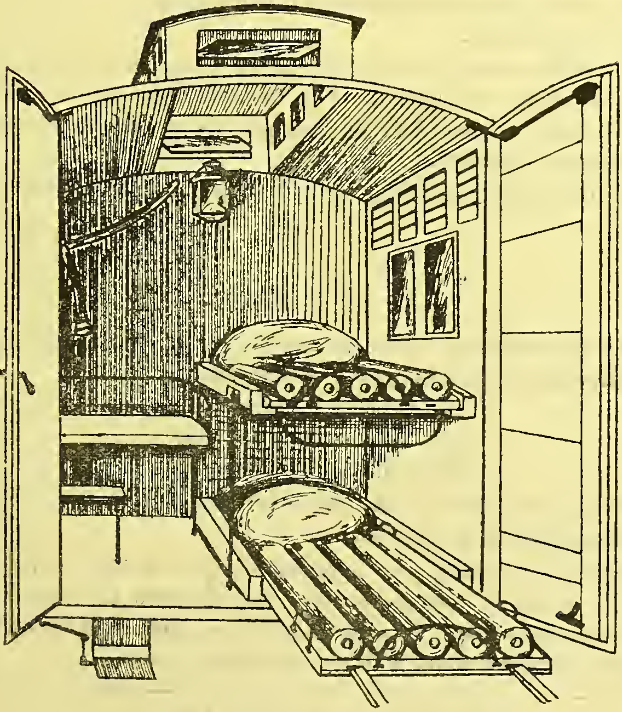


Fig. XIII.

It can be used either with one or two horses, and weighs $9\frac{1}{2}$ cwt. Two squares of the panels on each side are of blue glass; ventilating louvres extend along each side above the panels, and windows, turning on central pivots, are fixed along the sides and back of the dome. The inside is lined with varnished wood, and is entirely free from any absorbent furniture. It is adapted either for a single adult patient or for two of the same family. The bed consists of five air tubes the whole length of the stretcher, placed side by side, with an air pillow. The stretcher is either caned or canvas covered, and is fitted with galvanized telescopic handles at each end, and galvanized handles at the sides. It has ball castors underneath, on which it rolls easily on tram lines fixed on the floor of the carriage, and (when there are two beds) on the frame to carry the upper bed. The carriage is warmed with hot water when necessary. The nurse's seat is at the head of the patient, on his right side, so that her own right hand is available to minister to his wants. She can communicate with the driver through a speaking tube, should she require the assistance of the attendant, who rides with the driver, in case of delirium or accident.

Another type of carriage in frequent use is shaped like a double brougham, and is preferred when the patient is removed from a private house, or when it is undesirable to attract attention. The same kind of stretcher bed is used, and is passed into the carriage through the back, which is made to open.

In both types the driver's seat contains duplicates of all the *screws, nuts, etc.*, used in the construction of the carriage, with *rope* and *splints* for a broken shaft, &c.

The omnibuses are for the transfer of convalescent patients to the hospital out of London, and the two-wheeled light cart is intended to be sent in case of an accident happening in the streets, to an ambulance when removing a patient.

The pace when removing acute cases is not to exceed five miles an hour.

II.—*River Service.*

This is exclusively used for cases of small-pox, and consists of three wharves for the embarkation of patients, viz.:—

The West at Fulham;
The North at Poplar; and
The South at Rotherhithe.

The annexed plan of the south wharf at Rotherhithe shows the general arrangement of the wharves.*

There is a floating pier approached by a bridge, and so placed that there is water enough to allow the steamers to come alongside at all times of the tide. In each there is a covered shed into which the ambulance carriages drive, with an examination room.

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* *See* plan of South Wharf, Fig. XIV., p. 285.

FIG. XIV.

SOUTH WHARF, ROTHERHITHE.

HEAD QUARTERS OF THE RIVER AMBULANCE SERVICE.

A. B. C. Red Cross. Maltese Cross. Albert Victor.
D. Mooring hulk.
E. Embarkation pier.
F. Arrival shed and Examination room.
G. Offices.
H. Piermen's quarters.
I. Stores.
K. Staff quarters.
L. Storehouse yard.

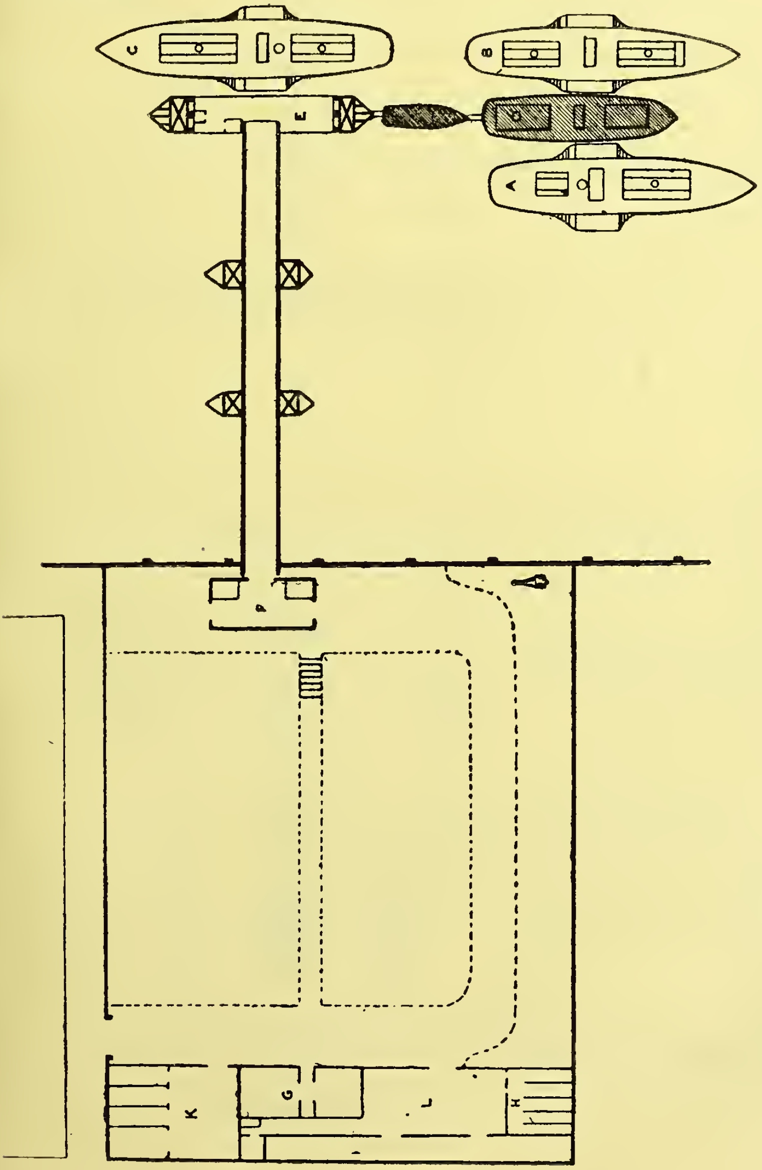
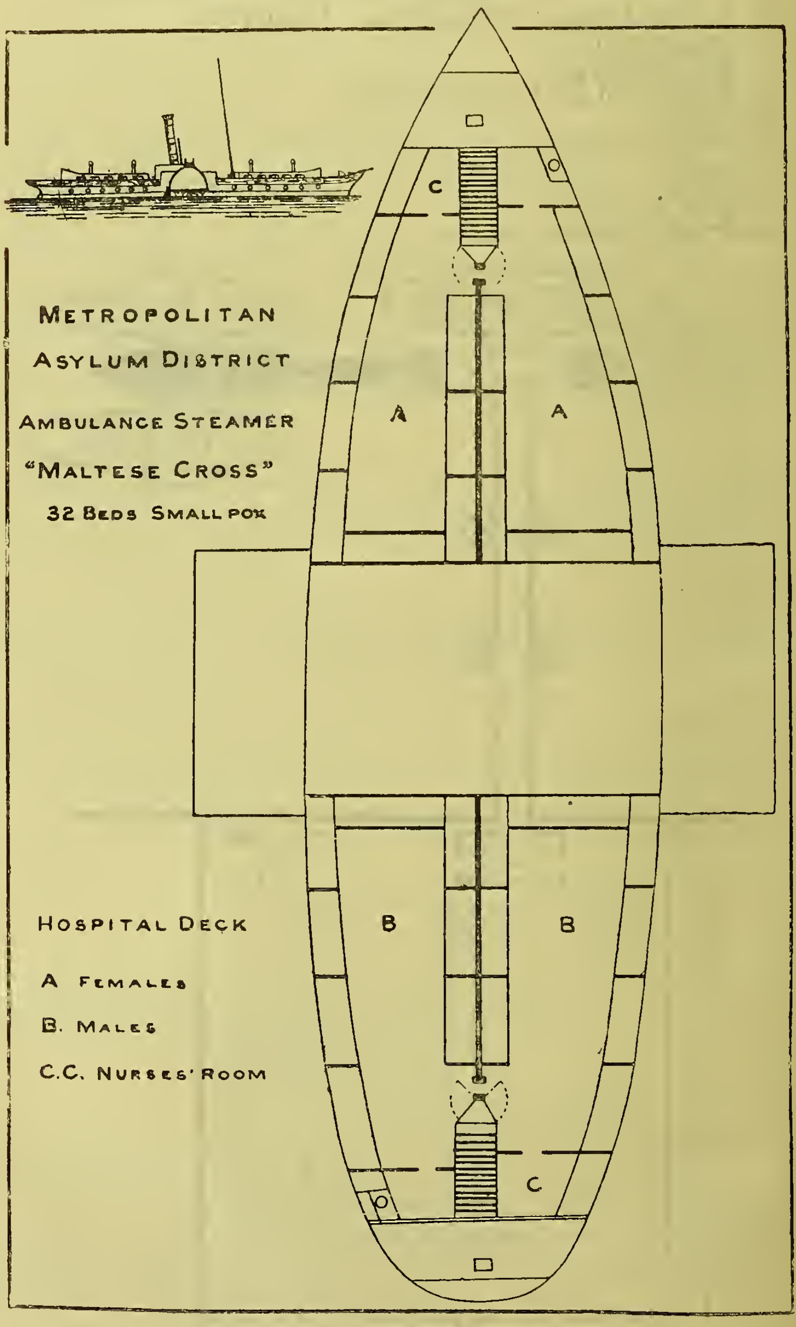


Fig. XV.


Metropolitan
Asylum District
Ambulance Steamer
"Maltese Cross"
32 Beds Small pox
Hospital Deck
A Females
B. Males
C.C. Nurses' Room
A
A
B
B
C
C

If the medical officer of the river service considers the patient to be in a condition to bear the voyage to the floating hospital, he is carried down to the steamer which is waiting alongside the pier, and placed in bed.

The wharf at Rotherhithe is the headquarters of the river service. Here is the office of the river superintendent, and here are moored the ambulance steamers. These are the "Red Cross," the "Maltese Cross," and the "Albert Victor." The "Red Cross" was the first steamer built for the managers. Her dimensions are, length 105 feet, breadth 16 feet 6 inches, and draught 4 feet. The hospital is in the fore cabin, and is divided by a bulkhead into two equal parts, each containing eight beds for adult acute cases. The after cabin was intended to receive recovered cases returning to London, but after the "Albert Victor" was fitted for ambulance service and used for the conveyance of these cases, the after cabin was appropriated to mild cases who did not require the recumbent position.

The "Maltese Cross" was built for the managers on an improved design, after experience gained from the use of the "Red Cross." Her dimensions are, length 132 feet, breadth 16 feet 6 inches, and draught 3 feet. There are two hospitals fore and aft, each containing 16 beds for acute adult cases.*

The "Albert Victor" was purchased from one of the Thames steamboat companies and fitted as a hospital. Her dimensions are, length 132 feet 6 inches, breadth 17 feet, and draught 4 feet. As in the "Maltese Cross," both fore and aft cabins are fitted as hospitals for 16 beds each for acute adult cases. She has been principally used for bringing back to London recovered cases.

In all the steamers there are cabins for the nurses, and the requisite appliances for the treatment of severe cases, as well as for the supply of appropriate nourishment. On deck there is a cabin for the medical officer, and accommodation for the captain and crew. Their speed is ten knots an hour, and they are handy to navigate in the river often crowded with shipping. The voyage from the south wharf at Rotherhithe to Long Reach occupies from an hour and a half to two hours, exclusive of the delay at the north wharf, when embarking patients. There is also a steam pinnace for general use.

III. *Removal and Distribution of Patients.*

In order to obtain the removal to a hospital of a case of small-pox, fever or diphtheria,† the medical practitioner in attendance, finding that the patient cannot be safely isolated and treated at home, writes out a certificate to this effect. Application is then made to the Ambulance Office at Norfolk House, by telegram or otherwise, in the following form:—

Name of patient; age; sex; disease; address.

Signed by the medical practitioner.

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* *See* plan of hospital deck, Fig. XV., p. 286.

† *See* Appendix D.

These particulars are immediately communicated by telephone to the ambulance station nearest to the patient's abode, and within three minutes an ambulance with a nurse and a male attendant, if the patient is over ten years, is *en route* to remove the patient. On arrival at the house, the certificate of the medical practitioner is handed to the nurse, without which there is no removal, and the patient is carefully placed in the carriage.

A "notice" is given to the friends, informing them to which hospital the patient will be taken, as well as a copy of the "regulations" relating to the information given by the medical superintendent of the hospital as to the condition and progress of the case; and also a copy of the "Rules for visiting patients when *dangerously ill*, as well as for their discharge when recovered."

On arrival at the hospital, the patient is examined by the medical superintendent, and a note of his or her condition, is sent to the friends. If seriously ill, a daily bulletin is sent to keep them informed of the progress of the case, and in order to prevent, as far as possible, inquiries being made at the hospital gates.

When the acute stage of the disease has subsided, the patient is transferred to the Northern Hospital, situated four miles outside the metropolitan area. Here the period of convalescence is passed, and as soon as all trace of infection has disappeared, he is brought back to the hospital in London which is nearest to his own home, and discharged. The friends have been duly informed of the day and hour of their arrival, and attend to meet them with their disinfected clothing.

Cases of small-pox are taken, in the first instance, to one of the London hospitals for examination. If the diagnosis made by the "certifying medical practitioner" is confirmed, and if the patient is in a condition fit to bear the journey to the Floating Hospital, he is taken to the riverside wharf, and carried to the ambulance steamer, is placed in bed, and conveyed to the ships at Long Reach.

No patient is under any circumstances allowed to remain at his home after an application for removal has been received. They are removed without delay; but may be detained at the hospital, to which they have been taken for examination, until the time for conveyance to the wharf has arrived. In order to avoid unnecessary delay at the wharves, a notice is sent daily to each of the ambulance stations, advertising the time of departure of the steamers.

The managers fully appreciating the danger of an invasion of the metropolis by epidemic disease at any time, and believing that the prompt removal of such cases as may occur is of the utmost importance, maintain an organization in constant readiness, by which they are able to place at any hour of the day or night, with the least possible delay, a fully equipped ambulance in charge of a careful driver, and with an experienced nurse, at the door of any house in the metropolitan district, a district extending over an area of 121 square miles, and containing considerably more than half a million dwellings inhabited by a population of 4,211,056

EXAMPLES OF REMOVAL.

The accompanying "Removal Notes" will illustrate the system. They refer to cases of scarlatina and small-pox, recently removed, and are duplicates of the "notes" filed at the stations.

SCARLATINA.

I.

METROPOLITAN ASYLUM BOARD.

WESTERN AMBULANCE STATION,
Seagrave Road, Fulham.

Message received, 9.1 a.m.
Name, Alice Alloway.
Address, 3, Kenway Road, Earl's Court.
Age, 12.
Parish, Kensington.

(Stamp.)

Date

Dr. Barr.
Description of case, Scarlet Fever.
Remarks:—Removed to Western Hospital.

No. I. is the telephone message received at the station and taken down by the clerk.

II.

This note to be left at the hospital with the patient.

METROPOLITAN ASYLUMS BOARD.

WESTERN DISTRICT AMBULANCE STATION,
Fulham, 18 .

(Stamp.)

Name, Alice Alloway, 12.
Removed from 3, Kenway Road, Earl's Court.
Name and Address of nearest relative or friend, or of a resident in above house. } ______________
Chargeable to Kensington.
Dr. Barr.

W. CRAIG,
Superintendent.

No. II. is the "note" which accompanies the patient to the hospital.

The "notes" for fever and for diphtheria are in *red* and that for small-pox is in *black* ink.

III.

Driver's and nurse's note.

METROPOLITAN ASYLUMS BOARD.

WESTERN DISTRICT AMBULANCE STATION,

Fulham, 18 .

(Stamp.)

Left at 9.4 a.m.
Returned at 9.57 a.m.
Name, Alice Alloway, 12.
Residing at 3, Kenway Road, Earl's Court.
Chargeable to Kensington.
Nurse, Hicks.
Driver Sells, Attendant Lock, No. 11 Ambulance.
Patient recd. by C. Dunmane at 9.54 a.m.
Ambulance arrived 9.51 a.m. o'clock. }
Ambulance left 9.55 a.m. o'clock. } To Western Hospital.
W. R. Clark, Gate Porter. }

No. III. is given to the nurse and driver for their guidance. The time of arrival at the hospital with the patient is added on the return of the ambulance.

IV.

WESTERN HOSPITAL,

Seagrave Road, Fulham, S.W.,
5 May 1891.

The Medical Superintendent begs to state that Alice M. Alloway, admitted yesterday, is "Doing well at present."

No. IV. card is sent to the friends of the patient to inform them of his condition.

These notes may be summarised as follows :—

At 9 a.m., May 4th, information is received at Norfolk House that Alice Alloway, aged 12, residing at No. 3, Kenway Road, Earl's Court, Kensington, is certified by Dr. Barr to be suffering from scarlatina and requires admittance into hospital.

At 9.1, the message is received at the Western Ambulance Station being the nearest to her home.

At 9.4, ambulance No. 11, left the station in charge of Nurse Hicks, with driver Sells and attendant Lock, to remove the patient.

At 9.51, the ambulance arrived at the hospital, and

At 9.54 the patient was received by Nurse Dunmane.

At 9.57 the ambulance returned to the station.

Notice left with the friends of Alice Alloway.

METROPOLITAN ASYLUMS BOARD.

WESTERN AMBULANCE STATION.

Notice of removal of patient to hospital.

(Stamp.)

Date 189 .

To the Nearest Relative or Friend of the undermentioned Sick Person.

(Name of Patient) Alice Alloway.

(Address) 3, Kenway Road, Earl's Court,

will be removed to the Western Hospital, situate at Seagrave Road, Fulham.

On the other side is a copy of the Regulations as to the furnishing of information relative to the condition of patients, and as to the visiting of patients at such Hospital, to which your serious attention is requested.

METROPOLITAN ASYLUMS BOARD.

FEVER AND SMALL-POX HOSPITALS.

Regulations as to furnishing information relative to the condition of patients, and as to the visiting of patients.

INFORMATION AS TO CONDITION OF PATIENTS.

2. Upon the admission of a patient, a letter will be sent to the nearest known relative or friend, setting forth the state of the patient; should any serious change for the worse take place, a letter will be sent daily to the relative or friend, stating how the patient is progressing, which letter will be continued until the patient is in such a condition as to render further communication unnecessary; but should the patient become dangerously ill, notice will be sent to the nearest known relative or intimate friend, with an intimation that the patient may be visited; and, at the discretion of the Medical Superintendent, arrangements may be made for the conveyance of the visitor to and from the Hospital.

3. Inquiries as to the condition of patients must be made in writing to the Medical Superintendent, who will reply by return of post. It is very undesirable that friends of patients should personally make inquiries at the Hospital.

VISITING.

4. The visiting of patients is limited to the nearest relatives and intimate friends of patients dangerously ill. One visit only will be allowed daily to each patient. Visits, which will *not* be *permitted without the permission* of the Medical Superintendent, are, as a rule, to be limited in duration to a quarter of an hour. In urgent and special cases, however, the Medical Superintendent is empowered to increase the number of visitors to two, and to extend the duration of the visit.

5. Visitors are warned that they run great risk in entering the Hospitals. They are advised not to go into the wards of the Small-pox Hospitals without having been properly re-vaccinated, and if they reside where the case visited occurred, are earnestly requested to urge the remainder of the occupiers of such house to call at once on the Public Vaccinator (whose address can be obtained from any of the parish officers) for the purpose of being vaccinated.

6. Visitors are further advised not to enter the wards in any of the Hospitals when in a weak state of health or in an exhausted condition, but to partake of a good meal before entering the Hospitals. They will be required when in the wards

to carefully avoid touching the patient, or exposing themselves to his breath, or to the emanations from his skin; and will not be permitted to sit on the bed or handle the bed clothes, but will be allowed to sit on a chair by the bedside at some little distance from the patient.

7. Visitors will also be required to wear a wrapper (to be provided by the Board) to cover their dress when in the wards, and to wash their hands and faces with carbolic soap and water before leaving the Hospital, or to use such other mod of disinfection as may be directed by the Medical Superintendent.

8. Visitors are strongly urged not to enter any omnibus, tram-car, or other public conveyance immediately after leaving the hospital.

By Order of the Board,
T. D. Mann,
Clerk.

Chief Offices of the Board,
Norfolk House, Norfolk Street,
Strand, W.C.,
18th June 1887.

Small-Pox.

This note to be left at the Hospital with the Patient.

METROPOLITAN ASYLUMS BOARD.

South-Eastern District Ambulance Station,
New Cross, S.E.,
7th May 1891.

Name, George Everett, 32.

Removed from 48, Osprey Street, Lower Road, Rotherhithe.

Name and Address of nearest relative or friend, or of a resident in above house, — Father, Mr. Everett. Same address.

Chargeable to St. Olaves.

Dr. Sheedy, R.O.

T. G. Plumber,
Superintendent.

DRIVER'S AND NURSE'S NOTE.

Ambulance returned to Station, 4.25.

METROPOLITAN ASYLUMS BOARD.

South-Eastern District Ambulance Station,
New Cross, S.E.,
7 May 1891.

Name, George Everett, 32.

Residing at 48, Osprey Street, Lower Road, Rotherhithe.

Chargeable to St. Olaves. Dr. Sheedy, R.O.

Nurse, Westerdale.

Driver, Hemmings. Attendant, Smith.

Patient received by E. Westerdale, at 4.12 p.m.

Ambulance arrived, 4.9 p.m. o'clock.
Ambulance left, 4.20 p.m. o'clock. } South-Eastern Hospital.
J. West, Gate Porter.

In for Nurse, 3.12 o'clock
Out with Nurse, 3.22 o'clock.

South-Eastern Ambulance Station.

Transfer Note.

George Everett, aged 32.

Date, 7 May 1891. No. of Patients, 1.

From South-Eastern Hospital. To South Wharf.

Driver, Goodfellow. Attendant, Smith. No. of Vehicle, 6 S.P.

Left Station, 4.40 p.m. Returned to Station, 6.3 p.m.

Nurse, Westerdale.

Arrived South-Eastern Hospital, 4 45.
Left „ „ 4.52. } Gate Porter (Signed) J. West.

Arrived South Wharf Hospital, 5.13.
Left „ „ 5.20. } Gate Porter (Signed) R. Percival.

(Signed) T. G. Plumber,
Superintendent of Station.

In this case the patient was taken to the South-Eastern Hospital for examination by the medical superintendent; and, on the diagnosis being confirmed, was removed to the South Wharf for embarkation.

The "Transfer Note" is required for this removal. The steamer left the wharf at 5.20, and the patient was on board the "Atlas" hospital ship at seven o'clock.

Small-pox Epidemic of 1884–5.

The last epidemic of small-pox in 1884–5 gave active employment to the river service. It was most severely felt in the east and north-east districts of the metropolis, and the greatest number of cases for embarkation to the floating hospital, were concentrated at the North Wharf, thus enabling the river transport to be worked with little delay.

The following return shows the number of cases removed from London to the floating hospital by the ambulance steamers.

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.
1884.	—	92	146	256	890	1,041	677	275	325	420	627	833	5,592
1885.	903	698	496	879	1,051	608	364	182	135	52	65	35	5,468
											Total -	-	11,060

The epidemic may be said to have commenced in February 1884, and had practically terminated in December 1885. The greatest number of cases occurred in the months of May and June in each year.

At the beginning of the year the "Red Cross" was the only steamer ready for service, and the first batch of patients was conveyed to the floating hospital in her in February. Afterwards the three steamers were constantly engaged in carrying patients from London to the ships, and on the return journey with recovered cases from Long Reach to London.

As the system was novel and experimental, it was felt that great caution was necessary, and at first *convalescent* cases only were embarked. They were all "transfers," and had all passed through the acute stage of the disease in one of the London hospitals; but after some experience of the comfort and simplicity of this method of transport, *mild* cases began to be sent direct from their homes to the wharves

for embarkation, and gradually the proportion of "direct" cases to "transfers" was increased, until at last complete confidence was gained and, with very few exceptions, *all* cases, severe as well as mild, were removed from their homes to the ships without the intervention of a London hospital.

Some inconvenience was occasioned by patients who, although "certified" to have small-pox, were found on arrival at the wharves, not to be suffering from it and who could not be effectually isolated on the ambulance steamers or on board the hospital ships. Patients were therefore taken in the first instance to the nearest London hospital for examination, and the medical officers of the ambulance service were also instructed to examine all cases on arrival at the wharves, and to send to the nearest land hospital, every case in which the nature of the disease was open to doubt. All persons who were not suffering from small-pox were vaccinated and sent home at once.

During the winter of 1884–5, fogs were not unusually prevalent, and the navigation was not often interrupted, but on a few occasions patients intended for the hospital ships, were obliged to be sent back from the wharves to the London hospitals; and twice, patients had to be detained in the ambulance steamers all night, owing to foggy weather, without, however, any injurious results.

The medical officer in charge of the river service was able to report as the result of the experience gained during the epidemic of 1884–5, that "no difficulty need arise to prevent the prompt removal to the floating hospital of every case of small-pox."

During the epidemic, 11,060 patients were removed by the land and river service to the hospital at Long Reach, and 10,076 recovered patients were brought back to London for discharge. During the same time 175 *doubtful* cases were sent from the wharves to the London hospitals, 38 cases of small-pox were detained in the London hospitals on account of fog, and 35 cases not having the disease at all, were vaccinated and sent home. The greatest number of patients taken down the river on one day was 104 by the "Red Cross" in three trips. During the same time also, many visitors to patients "dangerously ill," as well as a very large number of the staff of the hospital, and many tons of stores of all kinds were conveyed daily to and fro by the steamers.

During the height of the epidemic four voyages per day were made from London to Long Reach, viz., at 11 a.m., 3 p.m., 6 p.m., and at 8 p.m. The "Maltese Cross" and the "Red Cross" each making two journeys to and fro. The "Albert Victor" was generally employed in bringing back recovered cases to London. Each steamer started from the South Wharf at Rotherhithe, and called 20 minutes later, at the North Wharf at Poplar. The land service was so arranged that the ambulances with patients, arrived at the wharves 20 minutes before the time of departure of the steamer, which was duly advertised to the superintendent at each station, and the embarkation was effected systematically and without confusion. There was abundance of assistance of both nurses and attendants, and every patient was quietly carried on

his stretcher from the ambulance carriage and placed in bed on board the steamer. During the epidemic the staff employed consisted of:—

1 superintendent of the river service.	
1 clerk to superintendent	steamers.
2 medical officers -	steamers.
4 nurses - - -	steamers.
3 captains - -	steamers.
3 mates - - - -	steamers.
3 engineers - -	steamers.
4 stokers - - -	steamers.
6 deck hands - -	steamers.
2 cleaners (females) -	steamers.
2 pier masters - -	wharves
2 telephone clerks - -	wharves
6 pier hands - -	wharves

At the close of the epidemic the Ambulance Committee reported the "satisfaction they felt that so large a number of persons of both sexes and "all ages, most of them in much physical suffering, and many absolutely "helpless from disease, had been carried in all weathers and throughout "all seasons of the year, and to a great extent during the hours of dark-"ness, without detriment or discomfort to the patients and without "mishap to any person whatever."

The question is often asked, what is the cost of an epidemic, and what price do the ratepayers pay for the means provided by the Metropolitan Asylums Board to limit, if not to prevent, the spread of infectious disease in their midst? The epidemic of small-pox described above may be taken as an example. Great difficulty is experienced in answering this question correctly.

All the hospitals in London received both fever and small-pox patients in 1884–5, and no separate accounts of the expenditure on each disease were kept, but an approximate estimate may be arrived at by (1) setting down the expenditure on the establishments specially devoted to the reception of small-pox cases, and (2) by calculating what proportion of the expenditure on the land hospitals and land ambulance service should be charged to this disease.

	£
1.—*a. The Floating Hospital.*—Total cost during 1884–5 was 68,631*l.*, from which may be deducted 24,000*l.*, being the average nominal cost of maintaining the ships when without patients for two years - - - - - -	44,631
b. The Camp for 1,000 convalescent patients at Darenth, maintenance and administrative charges -	81,112
c. Plaistow Hospital, rent for 1½ years with maintenance, &c., &c. - - - - -	8,882
d. River ambulance service - - -	16,860

	£
2.—*e.* At the beginning of the epidemic three-fourths of all the patients admitted into the land hospitals in London were suffering from small-pox, but as has been explained, convalescents were at an early period transferred to the ships, *mild* cases were soon afterwards removed from their homes to the wharves, and at last *all* cases, with few exceptions, were so treated, and the land hospitals admitted fever cases only. Under these circumstances the total expense may be fairly divided between the two diseases. The total expense of the land hospitals during the period was 171,759*l.* Deducting one-half, it leaves 85,880*l.* to be added to the cost of the epidemic* - - -	85,880
f. A similar deduction can be made from the total expenditure on the land ambulance service, but in this case one quarter only should be deducted, as three-quarters of all the patients were suffering from small-pox and were carried either to the hospitals or the wharves, and the expense must be debited in either case to small pox - -	19,800
Total - -	£257,165

As 11,060 cases were admitted during the period, it follows that each case cost 23*l.* 5*s.*

This is exclusive of the capital expenditure on the sites and building of the hospitals, wharves, and ambulance stations and steamboats. The sums thus expended are raised on loan from the London County Council at 3½ per cent. interest, and are repayable in an average of 50 years. The cost of the epidemic was defrayed from the current account of the managers, and was a charge on the rates of the several parishes of the district.

* This sum includes about 20,000*l.* expended on clothes given to every patient on discharge, to replace their own clothes, which were destroyed.

APPENDICES.

A.—Land ambulance service, number of cases removed.

B.—Detail of work in 1890.

C.—River service, numbers removed to the floating hospital, with details of work done in 1890.

D.—Regulations for the "removal of persons suffering from infectious diseases," both to the Board's hospitals and to other places.

E.—Regulations to be observed by students attending the hospitals for clinical instruction.

F.—Daily returns of patients admitted into fever hospitals.

APPENDIX A.—Land Ambulance Service.

Number of Patients removed by the Ambulances of the Board.

—	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	1890.	Totals.
Fever.											
From homes to hospitals.	356	1,472	1,733	2,329	1,723	2,151	6,394	5,050	5,680	8,235	35,123
Convalescents to Northern and other hospitals.	—	—	—	—	—	—	1,793	2,455	1,731	3,508	9,487
Recovered cases from Northern Hospital to town hospitals for discharge.	—	—	—	—	—	—	1,088	2,710	1,372	3,084	8,254
Ditto Gore Farm Hospital ditto.	—	—	—	—	—	—	—	—	—	309	309
From hospitals to homes.	—	—	*463	1,087	245	110	212	300	125	136	2,678
Total fever patients	356	1,472	2,196	3,416	1,968	2,261	9,487	10,515	8,908	15,272	55,851
Small-pox.											
From homes to hospitals and wharves.	624	562	348	6,099	6,091	125	62	64	5	26	14,006
From hospitals to wharves.	—	—	—	3,152	1,573	23	49	62	5	—	4,864
From hospitals and wharves to homes.	—	—	—	4,324	5,934	69	18	13	—	—	10,358
Total small-pox patients.	624	562	348	13,575	13,598	217	129	139	10	26	29,228
Conveyance of patients to other places than managers' hospitals.	—	—	—	—	—	—	—	1	4	125	130
Grand totals -	980	2,034	2,544	16,991	15,566	2,478	9,616	10,655	8,922	15,423	85,209

* Includes some small-pox cases.

N.B.—(1) The Eastern Ambulance Station commenced work on the 14th July 1881 at London Fields; the South-Eastern Station on the 1st October 1883; and the Western Station on the 9th July 1884.

(2) Section 6 of the "Poor Law Act, 1889," which authorises the use of the managers' ambulances for the general conveyance of the infectious sick, was not adopted until the 30th November 1889.

APPENDIX B.—LAND AMBULANCE SERVICE—*continued.*

RETURN OF WORK for the Twelve Months ended 31st December 1890.

Particulars of Work.	Number of Journeys.	Miles run. By Horses. 1.	2.	3.	4.	By Vehicles.
Removals from home—						
Fever patients to London hospitals	7,435	61,905	730	—	—	62,635
Small-pox patients to London hospitals.	29	244	33	—	—	277
Non small-pox patients returned home -	28	276	15	—	—	291
Other patients returned home - -	39	334	18	—	—	352
Patients sent for, but for various causes not removed.	66	461	—	—	—	461
Patients' friends taken from hospital to home.	2	11	—	—	—	11
Transfers between hospitals—						
Fever convalescents to Northern Hospital.	520	490	10,883	367	1,635	13,375
Fever convalescents to Gore Farm Hospital.	50	—	1,116	48	765	1,929
Fever convalescents to other hospitals.	86	704	813	—	—	1,517
Small-pox patients to wharves -	22	110	—	—	—	110
Recovered patients taken home—						
From hospitals—fever - -	120	983	72	—	—	1,055
From wharves—small-pox - -	—	—	—	—	—	—
Service requirements - - -	125	943	97	—	5	1,035*
Conveyance of ambulance committee -	1	—	3	—	—	3
Conveyance of hospital stores—						
Fever - - - -	1	10	—	—	—	10
Small-pox - - - -	—	—	—	—	—	—
	8,524	66,468	13,780	415	2,405	83,061
Conveyance of patients to other places than managers' hospitals.	120	975	387	—	—	1,362
Totals for 1890 - -	8,644	67,443	14,167	415	2,405	84,423
Totals for 1889 - -	5,594	40,957	6,276	232	881	48,346
Totals for 1888 - -	5,550	34,842	12,767	—	1,910	49,519
Totals for 1887 - -	6,507	51,894	5,223	—	1,009	58,126
Totals for 1886 - -	2,073	13,578	1,980	—	—	15,558
Grand totals - -	28,368	208,714	40,413	647	6,205	255,972

* Including half journey by vehicle lent to small-pox hospitals committee.

APPENDIX C.—River Service.

Number of Patients, Visitors, Staff, &c., conveyed to and from the Hospital Ships during the year 1890.

Month.	Patients conveyed to Hospital Ships.	Recovered cases conveyed from Hospital Ships.	Visitors conveyed to and from Hospital Ships (including Managers).	Staff, &c. conveyed to and from Hospital Ships.	Totals.
January	2	—	5	44	51
February	3	1	2	30	36
March	7	5	1	59	72
April	4	8	—	22	34
May	4	3	7	43	57
June	3	6	22	20	51
July	—	1	—	15	16
August	1	—	—	13	14
September	1	1	—	17	19
October	—	—	—	19	19
November	1	—	—	34	35
December	—	—	1	23	24
Totals for year 1890	26	25	38	339	428
Totals for 1889	5	4	51	445	505
Totals for 1888	62	63	246	476	847
Totals for 1887	54	45	395	478	972
Totals for 1886	130	145	458	*3,929	4,662
Totals for 1885	5,468	5,809	†	†	11,277
Totals for 1884	5,592	4,267	†	†	9,859
Grand Totals	11,337	10,358	1,188	5,667	28,550

Steamers.

Steamer.	Fires alight.		Under Steam.		Under Way.		Coal consumed.		Number of Days when under Steam.	Distance run.
	Hours.	Mins.	Hours.	Mins.	Hours.	Mins.	Tons.	Cwts.		Miles.
"Red Cross"	219	5	138	15	70	28	21	—	32	734
"Maltese Cross"	323	40	211	5	111	2	67	10	48	1,159
"Albert Victor"	170	35	121	30	67	17	27	10	26	726
"Swallow"	369	40	247	20	164	25	12	15	47	1,390
Totals	1,083	0	718	10	413	12	128	15	153	4,009

Quantity of Stores, Parcels, &c., conveyed to and from the Hospital Ships.

Number, 1,688. Weight, 63 tons 4 cwts.

* Included in this number is the number of contractors' workmen who were engaged on building and other work in connexion with the Hospital Ships, and who were conveyed to and from Long Reach each week.

† These figures were not given in the Committee's Annual Report for 1884 and 1885.

APPENDIX D.—Ambulance Service.

Removal of Persons suffering from Infectious Diseases.

1. Apply on week days, between 8 a.m. and 8 p.m.	To the Chief Offices.	Postal Address: Norfolk House, Norfolk Street, Strand, W.C. Telegraphic Address: Asylums Board, London. Telephone Number, 2587.

N.B.—Applications in the latter part of the day must be despatched in time to reach the Offices before 8 p.m.

At night, between 8 p.m. and 8 a.m., and on Sundays, Christmas Day, and Good Friday.	To the Ambulance Stations.	Eastern Ambulance Station, Brooksby's Walk, Homerton, N.E. South-Eastern Ambulance Station, New Cross Road (near Old Kent Road Railway Station), S.E. Western Ambulance Station, Seagrave Road, Fulham, S.W.

2. Removal to the Board's hospitals:—

(*a.*) Only persons suffering from small-pox, fevers, or diphtheria, are admitted into the Board's hospitals.

(*b.*) Every application must state the name, age, and full address of the patient, from what disease suffering, and in cases of fever, the particular kind of fever; and also the name of the person making the application.

(*c.*) Unless a medical certificate be handed to the ambulance nurse, the patient will not be removed.

(*d.*) Patients should leave all valuables, money, &c., and all outside clothing at home, should wear body linen only, and be wrapped in the blankets provided for the purpose.

(*e.*) The ambulance nurse will leave at the house from which the patient is removed a notice stating the hospital to which the patient is to be taken, and a copy of the regulations as to visiting, &c.

3. Conveyance to other places:—

(*a.*) Persons suffering from any dangerous infectious disorder may be conveyed by ambulance to places other than the Board's hospitals.

N.B.—Dangerous infectious disorders include the following:—Small-pox, cholera, diphtheria, membranous croup, erysipelas, scarlatina or scarlet fever, typhus, typhoid, enteric, relapsing, continued, and puerperal fevers, and measles.

(*b.*) Every application for an ambulance must state—

(i.) Name, sex, and age of patient.

(ii.) Description of disease, and in case of fever, the particular kind of fever.

(iii.) Full address *from* which the patient is to be conveyed.

(iv.) Full address *to* which the patient is to be conveyed.

(*c.*) The patient must be provided with a medical certificate of the nature of the disease, to be handed to the driver of the ambulance.

(*d.*) The charge for the hire of the ambulance, including (when the patient is over 10 years of age) the services of a male attendant is 5*s.* This amount must be paid to the driver, who will give an official receipt for the same.

(*e.*) One person only will be allowed to accompany the patient, and such person may be conveyed back to the place from which the patient was conveyed. If desired, a nurse will be supplied at an additional charge of 2*s.* 6*d.* for her services.

(*f.*) The ambulances may be sent outside the Metropolitan district only by special sanction of the ambulance committee or of the Clerk to the Board, and in such cases an extra charge will be made of 1*s.* for every mile outside the Metropolitan area.

4. The drivers of the Board's ambulances are not allowed to loiter on their journeys or to stop for refreshments, on pain of instant dismissal. It is particularly requested that any breach of this regulation, or any neglect or incivility on the part of the drivers, nurses, or attendants, may be immediately reported to the undersigned.

The servants of the Board are forbidden to accept any gratuities or refreshments.

By order,

Dated 16th December 1889. Clerk to the Board.

APPENDIX E.

REGULATIONS to be observed by STUDENTS.

1. No student shall be admitted to study at the fever hospitals without the authority of the medical school to which he belongs.

2. No student shall be allowed to attend the fever hospital before the end of the third year of his medical education, nor until he has held the offices of clinical clerk and dresser.

3. The minimum duration of the course of study shall be two months, the student being at liberty to attend at the hospital at least three days in each week. In order to obtain a certificate, he shall be required to attend not less than two days in each week during the whole period of two months.

4. The fee, which must be paid in advance to the clerk to the Board, shall be three guineas for the first two months, and one guinea for each subsequent month.

5. The student, when so authorised by his school, shall attend at the office of the Metropolitan Asylums Board, bringing with him evidence of the authority required by Regulation No. 1.

6. The Asylums Board shall furnish him with a card, stating the hospital to which he will be attached, and the times at and during which he should attend.

7. A register shall be kept at each fever hospital, in which shall be entered the name and the school of the student and his attendances.

8. When the student shall have satisfactorily completed the course of study he shall receive a certificate to that effect from the Asylums

Board, after it has been signed by the medical superintendent of the hospital at which the student has attended.

9. The student, while within the hospital gates, shall in all respects be subject to the control of the medical superintendent of the hospital to which he is attached, and shall strictly obey the regulations made from time to time by the Asylums Board with regard to disinfection.

10. In the case of breach of discipline on the part of a student, the medical superintendent may suspend him from attendance at the hospital, and shall report the suspension at once to the clerk to the Board, who shall report it to the dean of the school to which the student belongs.

Rules as to Disinfection.

1. Every student will be required to wear, as long as he is within the hospital, a suit of brown holland overalls, consisting of coat, trousers, and cap, which will be provided by the Asylums Board.

2. As far as the hospital arrangements admit, three rooms shall be set apart for the students. The first, which the student reaches on entering the hospital (room A), shall be a cloak room, in which he shall hang his outer clothing; the second room leading out of this (room B), shall be a lavatory; the third (room C), also in direct communication with the second, shall contain the hospital suit, which the student shall put on, and then pass direct into the hospital.

On leaving the hospital, the student shall enter room C and take off his hospital suit. Then, passing into the lavatory, he shall wash and disinfect his hands and face; after which he shall go into room A, resume his outer clothing, and at once quit the hospital.

3. Every student shall keep his hair short, and satisfy the medical superintendent that he is sufficiently protected against small-pox by vaccination or otherwise.

That the above regulations shall apply, so far as may be practicable, to any qualified medical man who may be desirous of attending the course of study, and who shall obtain the consent of the medical superintendent of the hospital at which he may elect to study.

APPENDIX F.—Metropolitan Asylums Board.

Form of Daily Return of Patients admitted into the several Fever Hospitals of the Board during the day of 189 .

	Parish or Union.	Eastern Hospital.				North-Western Hospital.				Western Hospital.				South-Western Hospital.				South-Eastern Hospital.				Totals.				Grand Total.
		Scarlet.	Diphtheria.	Enteric.	Other Diseases.	Scarlet.	Diphtheria.	Enteric.	Other Diseases.	Scarlet.	Diphtheria.	Enteric.	Other Diseases.	Scarlet.	Diphtheria.	Enteric.	Other Diseases.	Scarlet.	Diphtheria.	Enteric.	Other Diseases.	Scarlet.	Diphtheria.	Enteric.	Other Diseases.	
W. District.	Kensington																									
	Fulham																									
	Paddington																									
	Chelsea																									
	St. George's																									
	Westminster																									
N. District.	St. Marylebone																									
	St. Pancras																									
	Hampstead																									
	Islington																									
	Hackney																									
Central Dist.	St. Giles and St. George, Bloomsbury																									
	Strand																									
	Holborn																									
	London, City of																									
E. District.	Shoreditch																									
	Bethnal Green																									
	Whitechapel																									
	St. George-in-the-East																									
	Stepney																									
	Mile End Old Town																									
	Poplar																									
S. District.	St. Saviour's																									
	St. Olave's																									
	Lambeth																									
	Wandsworth and Clapham																									
	Camberwell																									
	Greenwich																									
	Woolwich																									
	Lewisham																									
	Totals																									

APPENDIX F.—*continued.*

Form of Daily Return of Patients remaining in the several Fever Hospitals of the Board at midnight on the day of 189 .

Hospital.	Beds occupied.						Further Beds ready for the reception of Patients.					Beds in Reserve which can be made available if and when required.	Beds reserved for Isolation purposes.	Total Accommodation.
	Scarlet.	Diphtheria.	Typhus.	Enteric.	Other Diseases.	Total.	Scarlet.	Diphtheria.	Typhus.	Enteric.	Total.			
Eastern Hospital - - - -														
North-Western Hospital - - - -														
Western „ - - -														
South-Western „ - - - -														
South-Eastern „ - - -														
Northern „ - - - -														
Totals - - - -														

STATISTICS.

It is proposed to supplement the foregoing description of the various institutions of the Board by some statistics of the fever and small-pox cases, and to offer certain observations thereon; also to present the various forms whereby the Statistical Committee of the Board is endeavouring to collate and record the details of every case treated in the Board's hospitals for the immediate use of the Board itself, and for future research by medical and statistical experts.

The science of the prevention and treatment of infectious diseases cannot but be advanced by the investigation of reliable records of past experience. Moreover, from both an economical as well as sanitary point of view, any such advance must operate towards the advantage of the ratepayers, who have to provide for the maintenance of so large a proportion of the infectious cases of the metropolis.

The following Table A. shows the admissions and deaths of patients and the mortality per cent., at the Board's fever hospitals during each year since the opening of the first hospital on the 25th January, 1870, together with the annual mortality per 1,000 persons living of the population of the metropolis from scarlet, typhus, and enteric fevers, and from diphtheria:—

A.—Admissions and Deaths of Patients and Mortality per Cent. at the Board's Fever Hospitals during each Year since the opening of the first Hospital on the 25th January 1870, together with the Annual Mortality per 1,000 Persons living of the Population of the Metropolis from Scarlet, Typhus, and Enteric Fevers, and Diphtheria.

Year.	Admissions.						Deaths.						Mortality per cent. of Patients treated in Managers' Hospitals.				Annual Mortality per 1,000 of estimated Population.			
	Scarlet.	Diphtheria.	Typhus.	Enteric.	Other Diseases.	Total.	Scarlet.	Diphtheria.	Typhus.	Enteric.	Other Diseases.	Total.	Relapsing Fever.	Diphtheria.	Typhus.	Enteric.	Scarlet.	Diphtheria.	Typhus.	Enteric.
1870 (25th Jan. to 15th May)	—	—	—	—	218 (Relapsing Fever)	218	—	—	—	—	14	14	12·84	—	—	—	1·88	0·10	0·15	0·30
1871 } (15 months to 31st Dec. 1872)	—	—	—	—	—	—	—	—	—	—	—	—	Scarlet	—	—	—	0·58	0·11	0·12	0·27
1872	108	—	134	279	343	864	11	—	30	57	70	168	10·78	—	23·62	21·96	0·28	0·08	0·05	0·24
1873	92	—	401	381	271	1,145	6	—	91	56	58	211	6·55	—	23·15	15·13	0·19	0·09	0·08	0·27
1874	804	—	536	435	359	2,134	89	—	106	63	84	342	12·15	—	19·62	14·87	0·77	0·12	0·09	0·26
1875	1,182	—	65	299	269	1,815	160	—	16	78	54	308	13·69	—	23·35	24·68	1·06	0·17	0·04	0·23
1876	671	—	139	288	294	1,392	90	—	28	59	71	248	12·13	—	19·31	20·34	0·65	0·11	0·04	0·22
1877	479	—	170	372	186	1,207	54	—	36	79	33	202	12·1	—	23·07	22·93	0·44	0·09	0·04	0·25
1878	679	—	168	484	233	1,564	91	—	47	100	40	278	14·34	—	26·25	20·26	0·49	0·15	0·04	0·28
1879	1,469	—	48	385	196	2,098	211	—	11	74	39	335	15·27	—	21·56	19·73	0·72	0·15	0·02	6·23
1880	1,949	—	28	248	239	2,464	242	—	6	43	37	328	12·3	—	20·68	15·63	0·82	0·14	0·02	0·19
1881	1,477	—	219	415	211	2,322	168	—	34	86	46	334	11·1	—	16·95	21·47	0·55	0·17	0·02	0·25
1882	1,850	—	148	515	354	2,867	189	—	27	104	60	380	10·37	—	16·92	20·71	0·52	0·22	0·01	0·25
1883	1,920	—	45	486	269	2,720	234	—	11	74	66	385	12·38	—	21·15	15·64	0·51	0·24	0·01	0·24
1884	1,845	—	29	493	180	2,547	234	—	5	98	55	392	12·27	—	20·00	18·82	0·35	0·24	0·01	0·23
1885	1,353	—	53	220	229	1,855	130	—	7	36	46	219	9·47	—	12·17	15·82	0·18	0·22	0·01	0·15
1886	1,780	—	10	333	74	2,197	151	—	4	47	22	224	9·4	—	42·10	14·85	0·17	0·21	0·00	0·15
1887	5,900	—	35	441	161	6,537	489	—	4	61	59	613	9·54	—	11·59	14·59	0·34	0·23	0·00	0·14
1888	4,408	99	1	450	194	5,152	501	46	—	72	60	679	9·89	59·35	—	14·64	0·28	0·31	0·00	0·16
1889	4,518	722	23	290	219	5,772	366	275	6	41	48	736	8·85	40·74	31·57	15·15	0·18	0·37	0·00	0·12
1890	6,537	942	16	498	341	8,334	510	316	5	93	81	1,005	7·84	33·72	25·64	19·66	0·19	0·32	0·00	0·14
Totals	39,021	1,763	2,268	7,312	4,840	55,204	3,926	637	474	1,321	1,043	7,401	10·27	37·52	20·90	18·24	—	—	—	—

Dealing with scarlet fever alone, it will be remarked that there was a rapid rise in the number of cases treated in the year 1887. In the autumn of that year the applications for the removal and isolation of cases of scarlet fever were far more numerous than had been experienced since the opening of the managers' hospitals and occasioned a considerable strain on their resources to meet the demand.

This increased demand was owing partly to the fact that the disease was more prevalent than in the two years immediately preceding, but perhaps in a greater measure to the publicity given to the operations of the Board and the consequent desire of the residents of the metropolis to avail themselves of the facility and comfort of removal offered by its ambulance system and of the more perfect means of isolation afforded by its hospitals. Also by the issue in that year of a Local Government Board Order authorising any medical practitioner to sign the medical certificate accompanying the order for admission of a relieving officer or master of a workhouse, while formerly such certificate could only be signed by the poor law medical officer.

As regards the prevalence of the disease in 1887, the number of deaths from scarlet fever, registered in London in that year was 1,447, giving a mortality of 0·34 per 1,000 living, whereas in 1885 and 1886 it was 0·18 and 0·17 respectively; the rate is also higher than it was in 1872 and 1873, but with these four exceptions, the death-rate of 1887 is below that of any year since 1871 and considerably below the decennial average, which was 0·47 per 1,000.

The Registrar-General in his "Summary" for 1887, when commenting on these facts, is of opinion that much alarm was entertained as to this disease (scarlet fever) in the autumn and winter of that year, owing to an exaggerated idea of its prevalence in an epidemic form, which was intensified by the publication in the daily papers of the admissions into and the number of beds occupied in the managers' hospitals.

This very publication, however, had a most desirable effect in drawing the closer attention of the population to the complete system of transport and isolation hospitals established in their midst, and probably operated towards reducing their antipathy against being treated in fever hospitals.

We shall now endeavour to show by a comparison of the statistics of recent years, that the improved systems of transport and isolation hospitals adopted by the Board, are probably not unimportant factors in causing the observed gradual reduction of the death-rate of scarlet fever of the metropolis. We admit that there may exist other causes tending towards this happy result, but these last can hardly account for the whole of the reduction.

The Registrar-General in his "Summary" of 1887, commenting upon this reduction, gave as a not impossible explanation, that it might be due to the increasing use of public hospitals for cases of this disease, in other words to improved isolation.

In support of this statement we would refer to the following Table B., which clearly indicates, as far as the metropolis is concerned,

this "increasing use" of the Board's isolation hospitals and the decreasing scarlet fever death-rate; in other words, while more patients are being treated in hospitals and fewer in their homes, the death-rate, with some variations, is gradually but surely diminishing.

B.—London Scarlet Fever Table showing that Increased use of Special Hospitals is followed by a Diminished Rate of Mortality among both the Population generally and the Patients in Hospital.

1. Year.	2. Increasing proportion of Scarlet Fever Deaths in Metropolitan Asylums Board Hospitals to Total Scarlet Fever Deaths in London, showing increasing use of Hospitals.	3. Decreasing London Scarlet Fever Death Rate per 1,000 Persons Living.	4. Decreasing Scarlet Fever Death Rate per 1,000 Patients treated in Metropolitan Asylums Board Hospitals.
1879	Between 7 and 8 per cent.	0·72	152·7
1880		0·82	123·0
1881		0·55	111·0
1882	9·4 per cent.	0·52	103·7
1883	11·6 "	0·51	123·8
1884	16·3 "	0·36	122·7
1885	18·0 "	0·18	94·7
1886	21·8 "	0·17	94·0
1887	33·8 "	0·34	95·4
1888	41·2 "	0·28	98·9
1889	46·6 "	0·18	88·5
1890	58·2 "	0·19	78·4

For the purposes of this argument we propose, first, to confine our attention to the figures from 1879 to 1886 inclusive, because, as above stated, in 1887 there was a sudden increase in the proportion of patients coming from a better-fed and better-housed class, and these were more likely to recover; a fact clearly demonstrated by a comparison between the scarlet fever death-rate of the London Fever Hospital and those of the Board, and one which would introduce an important and uncertain factor after 1886.

From 1879 to 1886 the patients may fairly be described as coming from about the same class, although the ameliorating sanitary condition of the metropolis probably had some sensible effect towards improving the condition of the poorer population, and thus increasing the number of recoveries.

Referring to Table B., column 2, the increasing proportion of scarlet fever deaths in the Board's hospitals to those of the whole of London will be observed. In the absence of notification, which only came into force in November 1889, it is impossible to state the exact proportion between the actual number of infected persons treated in the Board's hospitals and the total number of such cases in London, but the fact of this proportion being an *increasing* one, with a rapid break of continuity after 1886, is clearly indicated in

column 2, and supports the statement of the Registrar-General as to an "increasing use" of the Board's hospitals by the public.

During 1879–80–81 this proportion was between 7 and 8 per cent.; during 1882, 9·4 per cent.; in 1883 the proportion rose to 11·6; in 1884 to 16·3; in 1885 to 18, and 1886 to 11·8; while in 1887 it suddenly rose to 33·8.

As regards the decreasing rate of the London scarlet fever mortality, if we turn to column 3 we see that during the above years this rate per 1,000 has, with variations, decreased from ·72 in 1879, and ·82 in 1880, to ·18 in 1886.

As one cause of this decrease in the mortality we must take into account any observed decrease in the severity of the type of the disease itself. Referring to Table B., columns 3 and 4, it will be seen that the London scarlet fever death-rate per 1,000 persons living, decreases at a far more rapid rate than the scarlet fever death-rate per 1,000 persons treated in the Board's hospitals. The former decreased from ·72 per million in 1879, and ·82 in 1880, to ·16 in 1886, while the latter decreased from 154·2 to 90·0 during the same period. The decreasing severity of the type of the disease cannot therefore account for the whole of the satisfactory decrease of the general mortality.

It might be here mentioned that the decreasing scarlet fever-mortality rates in the Board's hospitals points to the probability that the increased use of hospitals and consequent concentration of scarlet fever patients within proper limits does *not* induce an aggravated type of the disease itself.

We will now examine the figures after 1886. Referring again to Table B., it will be seen that after the year 1886, when there was a break of continuity above referred to, the proportion of the total scarlet fever deaths in the hospitals to those in London rose from 21·8 to 33·8 in 1887, and then by rapid strides to 58·2 in 1890.

Though in 1887 and 1888, owing to the prevalence of the disease, the mortality rate for the metropolis rose to ·34 and ·28 per 1,000 respectively, yet in 1889 and 1890 we have the lowest fever mortality rates for the whole of London, with the exception of 1885–6, and the lowest rate for patients treated in the Board's hospitals that has been recorded during the 12 years included in the table.

In his "Summary" for 1890 the Registrar-General remarks that "the deaths ascribed to scarlet fever in London were 876, "being in the proportion of 0·19 to 1,000 persons living, the previous "decennial average having been 0·39." He also states that for several years the mortality from this disease has been declining, and although it would be rash to assert that this reduction is due to the increased facilities for removal and isolation afforded by the ambulance and hospital organisation of the Metropolitan Asylums Board, it is noteworthy that it has occurred simultaneously with the increasing use of their hospitals.

It may reasonably be believed that the measures taken by the Board have already exerted an appreciable influence in preventing

the spread of scarlet fever in the metropolis, and they hope that with the cordial co-operation of the sanitary authorities, as well as of the medical profession in London, much more may yet be accomplished.

As to small-pox, we append two returns.

C., shows the behaviour of small-pox in the metropolis since the year 1838, and D. gives the admissions, deaths, and the per-centage mortality in the Board's hospitals since their opening in 1871 to the end of 1890.

I.

C.—Return showing London Mortality from Small-Pox from 1838 to 1890.

Years.	Estimated Population in the Middle of each Year.	Deaths from Small-Pox.		
		Annual Total.	Annual Rate per Million of Population.	Rate per Million on Averages of Five Years.
1838	1,766,169	3,817	2,161	—
1839	1,802,751	634	352	—
1840	1,840,091	1,235	671	—
1841	1,878,205	1,053	561	—
1842	1,917,108	360	188	787
1843	1,954,041	438	224	399
1844	2,033,816	1,804	887	506
1845	2,073,298	909	438	460
1846	2,113,535	257	122	372
1847	2,202,673	955	434	421
1848	2,244,837	1,620	722	521
1849	2,287,302	521	228	389
1850	2,330,054	499	214	344
1851	2,373,081	1,062	448	409
1852	2,416,367	1,159	480	418
1853	2,459,899	211	86	291
1854	2,503,662	694	277	301
1855	2,547,639	1,039	408	340
1856	2,591,815	5	205	291
1857	2,636,174	156	59	207
1858	2,680,700	242	90	208
1859	2,725,374	1,158	425	237
1860	2,770,181	898	324	221
1861	2,815,101	217	77	195
1862	2,860,117	366	128	209
1863	2,905,210	1,996	687	328
1864	2,950,361	547	185	280
1865	2,995,551	640	214	258
1866	3,040,761	1,391	457	334

C.—Return showing London Mortality from Small-Pox from 1838 to 1890—*continued.*

Years.	Estimated Population in the Middle of each Year.	Deaths from Small-Pox.		
		Annual Total.	Annual Rate per Million of Population.	Rate per Million on Averages of Five Years.
1867	3,085,971	1,345	436	396
1868	3,131,160	597	191	297
1869	3,176,308	275	87	277
1870	3,221,394	973	302	295
1871	3,267,251	7,912	2,421	688
1872	3,319,736	1,786	537	708
1873	3,373,065	113	33	676
1874	3,427,250	57	16	661
1875	3,482,306	46	12	602
1876	3,538,246	736	207	161
1877	3,595,085	2,551	709	194
1878	3,652,837	1,417	387	266
1879	3,711,517	450	120	287
1880	3,771,139	471	124	309
1881	3,831,719	2,367	617	391
1882	3,893,272	430	110	271
1883	3,955,814	136	34	201
1884	4,019,361	1,236	307	238
1885	4,083,928	1,419	347	283
1886	4,149,533	24	5	160
1887	4,215,192	9	2	139
1888	4,282,921	9	2	132
1889	4,351,738	—	—	71
1890	4,421,661	4	0·90	2

II.

D.—RETURN showing the Admissions and Deaths of Patients and Mortality per cent. at the Managers' Small-Pox Hospitals during each Year since the opening of the first Hospital on the 1st December, 1870, together with the Annual Mortality per 1,000 persons living of the Population of the Metropolis from Small-pox, extracted from the Registrar-General's Annual Summaries.

Year.	Admissions.			Deaths.			Mortality per cent. of Patients treated in Managers' Hospitals.	Annual Mortality per 1,000 of Estimated Population.
	Small-pox.	Other Diseases.	Total.	Small-pox.	Other Diseases.	Total.	Small-pox.	Small-pox.
1st Dec., 1870, to 3rd Feb., 1871.	582	—	582	97	—	97	20·81	—
1871-2 (4th Feb., 1871, to 31st Jan. 1872).	13,139	6	13,145	2,460	—	2,460	18·95	2·42
1872-3 (year ended 31st Jan. 1873).	2,359	3	2,362	467	1	468	17·84	0·54
1873-4 (year ended 31st Jan. 1874).	174	17	191	35	—	35		0·03
1874 (11 months ended 31st Dec.).	112	8	120	10	—	10	17·02	0·02
1875 - - - -	89	22	111	22	—	22		0·01
1876 - - -	2,134	16	2,150	372	1	373	21·64	0·21
1877 - - - -	6,516	104	6,620	1,214	4	1,218	17·92	0·71
1878 - - -	4,558	96	4,654	824	9	833	17·99	0·39
1879 - - - -	1,628	60	1,688	273	5	278	15·09	0·12
1880 - - -	1,982	50	2,032	286	2	288	15·95	0·12
1881 - - -	8,551	120	8,671	1,417	14	1,431	16·61	0·62
1882 - - -	1,799	55	1,854	260	3	263	12·96	0·11
1883 - - - -	598	28	626	93	—	93	16·06	0·03
1884 - - -	6,363	204	6,567	940	3	943	15·98	0·31
1885 - - - -	6,146	198	6,344	1,052	3	1,055	15·8	0·35
1886 - - -	99	33	132	22	2	24		0·01
1887 - - - -	56	3	59	3	—	3		0·00
1888 - - -	62	5	67	8	—	8	14·75	0·00
1889 - - - -	5	—	5	—	—	—		—
1890 - - -	22	5	27	3	—	3		0·00
	56,974	1,033	58,007	9,858	47	9,905	—	—

It will be observed that the disease has not prevailed in an epidemic form since 1885, and that two years have clapsed since its expected visitation according to the series of invasion that has hitherto obtained. A few isolated cases only have been removed in each year. Many of these cases have been proved to have been imported from abroad.

Though the land ambulance service of the Board was partially organised in 1881, it was not until the epidemic of 1884 and 1885 that the combined land and river ambulance services were in full operation

for the whole Metropolitan district. The period since that epidemic is too short, and the number of cases too few, to allow of drawing final conclusions from the extraordinary decrease of—one might say, the practical immunity from—small-pox during the past five years. A consideration, however, of the following interesting small-pox pedigrees, furnished by Dr. Birdwood, Medical Superintendent of the Hospital Ships, shows how rapidly the disease sometimes spreads from single cases, and how incumbent it is on those responsible for the public health to bear in mind that, even in non-epidemic times, when conditions seem unfavourable to its propagation, every unisolated infected person should be looked upon as a possible focus of wide-spreading disease. Moreover, it points to the probability that the prompt removal to isolation hospitals, as effected during recent years by the combined land and river ambulance services, must have had a sensible effect in checking the possible spread of the disease.

The following are two of the small-pox pedigrees referred to. Those whose names are in italics were ill, but were not patients in the Board's hospitals :—

I. —Group of 19 Cases as to which Dates and Known Intercourse between Individuals indicate a Common Origin.

1887.

(*a*.)

(1.) Steward's boy imported disease from Lisbon, 31st August.

(2.) *His brother.*

(3.) Same house, 30th September.

(4.) Living in house, back to back house, 4th October.

(5.) Child next door, 16th October.

(6.) Rag sorter, 7th October, employed close by.

(7.) Child, ditto, 24th October.

(8.) Customer, 25th October.

(9.) Rag sorter, 29th October, employed by same master.

(*b*.)

(10.) Child, friend of 5 and 7, 1st November.

(11.) Brother, 12th November.

(12.) Sister, 13th November.

(*c*.)

(13.) *Child of water inspector, ill 14th November,* visited infected house

(15.) Mother, 30th November.

(17.) Sister 4th December.

(17.) Friend, 3rd December.

(19.) Son, 11th December.

(*d*.)

(14.) *Schoolfellow of* 18, *ill 11th November.*

(16.) Brother, 1st December.

II.—GROUP of 10 CASES probably connected, owing to Dates and Known Intercourse.

1891.

(1.) March 14. Origin not traced.

- (2.) March 26, lives in same house as (1.)
  - (3.) March 29, ditto.
    - (6.) April 10, ditto.
- (4.) April 1, worked at house frequented by (1) and served him March 16.
  - (5.) April 10, wife of (4).
  - (7.) April 11, went daily to 4's house.
  - (8.) April 14, lives at 4's house.
- (9.) April 21, disinfected 1's house after several patients had been removed.
- (10.) April 2 visited her daughter in neighbouring house to No. 1.

With respect to the year 1891, from the beginning of the year up to the end of May 53 patients were admitted into the hospitals of the Board suffering from small-pox.

First, as to 20 of these cases; only one could trace the source of his infection, having been exposed to small-pox infection at Lisbon, and they were all, with one exception, admitted between the 24th March and 23rd May.

One of these patients was admitted on the day of eruption; one the following day; seven two days after eruption; seven three days after eruption; four four days after eruption; and all these 20 cases were barren of further infection; a fact which illustrates the importance of early removal and isolation in preventing the spread of small-pox.

Secondly, as to the remaining 32 cases. Of these, 23 were distributed in small groups, of which the members were connected by known intercourse, and 10 were comprised in the large Group II. above set forth.

In conclusion we desire to state that spotted maps showing the incidence of scarlet, enteric, and typhus fever, small-pox, and diphtheria cases, notified under the Act of 1889, are published annually, and the clinical observations concerning the patients treated in the Board's hospital, which form the basis of their medical statistics, are carefully recorded. The "forms" were prepared by the Statistical Committee after conference with the representatives of the Local Government Board and the Board's own Medical Officers. They provide a complete record of each case. Register or "travelling cards," which are copies of the bed cards, follow the patients when transferred from the acute to the convalescing hospitals, and on the completion of the cases, are forwarded to the chief office and preserved for reference. Special attention is given to the evidence as to the presence or absence of vaccination cicatrices in small-pox, and as to the *number*, *area*, and *character* of such cicatrices when observed. These detailed observations are made and registered with the view of supplying those responsible

for the public health with accurate records of the largest infection hospital authority in the world. It is impossible to include within the limits of this paper a complete set of the statistical tables in use. For these and other particulars those interested in the subject are referred to the Annual Reports of the Statistical Committee of the Board.

DISCUSSION.

Dr. Dudfield (Kensington) traced the evolution of the Asylums Board from its original position as a pauper authority to its present one of a central authority for providing hospitals and ambulances for all classes of the population, reference being made to the Sanitary Act, 1866, and to the Metropolitan Poor Act, 1867, the Poor Law Acts of 1879 and 1889, and the Infectious Disease (Prevention) Act, 1890. In 1877, when small-pox was prevalent, the Local Government Board urged the sanitary authorities to provide local hospitals; but the advice was not followed, it being felt that this work could be better performed by a central authority, and that the Asylums Board should be such central authority, provided the hospitals were made free, and relief in them depauperised—a reasonable proposition, as 90 per cent. of the patients were not paupers. Reference was made to the Conference of Sanitary Authorities in 1881, at Kensington, when resolutions were adopted in this sense, and even afterwards presented to the Local Government Board, and a recommendation made that small-pox patients should be treated out of London; the result being the establishment, firstly, of the small-pox camps at Darenth, then of the hospital ships, and finally the erection of a permanent hospital at Darenth. During the last five years, the deaths from small-pox in London had aggregated 47, the country average number being 3,000.

In 1875 he recommended that the certificate of any doctor should be accepted as evidence of the nature of the infectious disease—a plan that was validated in 1887 by an order of the Local Government Board. Since 1884 or 1885 cases had been admitted on the application of any doctor, with manifold advantage to the metropolis. Happily the opposition to local hospitals had proved successful. The hospitals had been made free, and no loss of social position was incurred by admission, thus giving full effect to proposals he had made in a communication addressed to the Asylums Board in 1877.

Dr. Seaton (London) said that, having been intimately acquainted with the work of the Board, he knew very well how much the chairmanship of one of the epidemic or isolation hospitals of the metropolis involved. It involved great, continuous, and daily sacrifice. There was no one who had devoted himself more unselfishly than Surgeon-General Bostock, C.B., to the infection hospitals' work of London, and he knew that the Board was proud of the veteran Chairman of the Western Hospital Committee, and he hoped the compliment would be paid to him of printing his most valuable and interesting description of the Board's work *in extenso*.

Dr. Armstrong (Newcastle-upon-Tyne and the River Tyne Port) concurred in the encomia passed by previous speakers on the excellent paper read by Surgeon-General Bostock. The Metropolitan Asylums Board had a large and most important work, and were carrying it out well. It was gratifying to find the acknowledgment given by the writer of the paper to the action of the medical officers of health in support of

an efficient ambulance system for London. First of these was Dr. James Stevenson, and after him no one had done more to advance the movement than one of the preceding speakers, Dr. Dudfield.

The speaker noted with satisfaction the arrangements of the Metropolitan Asylums Board for affording facilities to medical students for acquiring a knowledge of infectious diseases in their hospitals—thus following the lead of Newcastle-upon-Tyne, where for some years past the students of the University of Durham College of Medicine at Newcastle had received instruction at the hospitals for infectious diseases.

With respect to the hospital ship "Castalia," it was to be hoped that that hospital would not be accepted as a model for imitation. The wards are built *en échelon*, a bad arrangement for efficient ventilation and lighting. They are also too close together and overshadow each other. The artificial system of ventilation adopted has made the hospital simply hideous to look at. The River Tyne Port Sanitary Authority had a short time ago provided a floating hospital of 30 beds, erected in three blocks, on a platform 140 feet long by 80 feet in width, the whole resting on ten pontoons. The speaker had successfully opposed the echelon arrangement of the wards, which are placed on three sides of the platform, thus leaving a large sheltered open space as an airing ground for convalescents, which the "Castalia" had nothing to equal. The administrative department was placed on a separate float moored to the hospital proper. In the "Castalia" the administrative department was below the wards, which is very bad indeed.

Dr. Hauser (Madrid) said:—I am rather inclined to attribute the great difference between the decreasing mortality in the London population from scarlet fever and the increasing death-rate from scarlet fever in the Metropolitan Asylums Board hospitals to the great accumulation of infectious patients in so limited a space, giving a higher degree of mephitism and infectivity.

The Prevention of Disease in Growing Towns.

BY

Surgeon-General Beatson, M.D., of Eastbourne.

During the past 50 years numerous towns claiming to be health resorts have sprung up in various parts of England. Among them are to be found places situate on the seashore, backed by open country, based upon a permeable quickly drying soil, well supplied with fresh air and pure water, and therefore exceptionally well fitted for their purpose. Some of these may retain for years their pristine salubrity, but all in the course of time become more or less unhealthy and subject to outbreaks of contagious disease principally affecting the young. After a long period of unbroken public health a few cases, say of diphtheria, make their appearance. These are followed at intervals by epidemic outbursts, and sometimes by the endemic establishment of disease if precautionary measures be not taken.

Such results threaten the commercial prosperity of health resorts by scaring away their visitors, and are especially disappointing to those who

have done their best to establish a healthy town upon a healthy site, but have not remembered that wherever men gather together in towns they encompass themselves with conditions productive of disease. The health of the human organism depends upon the nature of its surroundings, and no country village can be converted into a populous town without deterioration of its health conditions.

The old towns of England were founded while the country was little better than marsh and forest, before the nature and causation of disease was understood ; without forethought or attempt at prevention. Hence they became abundant in filth conditions, their soil, water, and air, both within and without the houses, utterly impure. The health of their inhabitants deteriorated, constitutional diseases became endemic, and upon them were engrafted epidemics of the most terrible kind—the black death, the sweating sickness, and the plague. These were all regarded, not as productions of the prevailing filth, but as imports from abroad, which might be suppressed by exclusion or confinement to the locality in which they first appeared. None of these measures have ever been successful, but the destruction of the City of London by fire caused the final disappearance of the plague, and proved that epidemic disease can be eradicated and prevented only by removing the insanitary conditions with which it is ever found associated.

During the last two or three centuries the whole face of the country and the life habits and surroundings of the people have undergone great change. It would now be impossible to revert to the swamp and filth conditions under which the epidemics of the middle ages originated, but still, wherever growing towns exist, there also is to be found growing impurity of earth, air, and water, tending to the establishment of infectious disease. It cannot be said that health resorts are built without care and forethought, for very great thought is generally exercised and great care taken to provide wide streets, open spaces, and houses of beautiful elevation. But the building of these necessitates the building of many more of inferior character. Drains and sewers are required; the drainage of a long low-lying flat is always a difficulty, and as the houses to be drained increase the difficulty becomes greater. The value of land for building purposes soon rises, and houses are built where they ought not to be built. These become receptacles of sewer emanations, and an unhealthy quarter is established. Infectious disease makes its appearance, and is kept secret as long as possible. When the epidemic arises it is declared to be an importation.

It is very much to be feared that recent discoveries in bacteriology tend to strengthen the idea that infectious disease is always an importation, and never the product of unwholesome surroundings. There is, of course, no doubt that bacterial organisms are concerned in the spread of certain forms of disease, but it should be remembered that they have not yet been, and never can be, proved to be primordial and not results of evolution. Those who would prevent disease in growing towns would do well to remember that disease, considered in the abstract, is not a self existent entity separate and apart from man, but a condition of his organism induced by other conditions unfavourable to its vitality; that

as it must at some time have had a beginning, so it may at any time originate *de novo ;* that it may be the result, not of one cause only, but of many concomitant causes, some of which are, and perhaps for ever will be, beyond our ken. Chief cause of all is impurity, whether from the non-elimination from the system of poisonous refuse or its re-introduction by means of the air, water, or solids which the organism ingests. Hence overcrowding, imperfect ventilation, and defective drainage are the prime causes of the condition of ill-health and lowered vitality which favours the establishment of zymotic disease in growing towns.

Numerous legislative enactments have been contrived for the prevention of disease, but none have been universally successful, because they are mostly optional, and have to be carried into effect by individuals who have not studied, or who do not much believe in sanitary science. The formation and sanitation of towns remains chiefly in the hands of private land-owners, speculative builders, town councils, local medical officers of health engaged in private practice, and untrained inspectors of nuisances.

When the high health-repute of some village near the sea draws to it a great influx of visitors, a demand for houses arises. The land-owner naturally sells as many as possible of his hitherto unproductive fields. The speculative builder covers them thickly with houses, sometimes badly built, and imperfect in sanitary arrangement. Open spaces at first carefully preserved as attractions, become gradually filled up. Drains and sewers, however well they may be planned, sooner or later become foul and infect the insanitary houses. Then disease makes its appearance. The councils of recently established and growing towns are, of all bodies, the most unfit to undertake the work of sanitation. They are not likely to acknowledge faulty arrangements which their own surveyors may have sanctioned, or to court investigation which they think may be injurious to the commercial prosperity of the town, or their own private interests. Some of them may be the builders or owners of houses which they very well know will not stand sanitary inspection. When the necessity of doing something is admitted, they may propose to adopt, without sufficient investigation or advice, some costly but questionable attempt at improvement, the burden of which may be thrown upon the shoulders of the resident public.

Here it may be thought that ratepayers would intervene; but the ratepayers in small communities are often apathetic or subservient; past experience has taught them that it is useless to attempt to influence the town council; and they are fearful of establishing a scare, or of being accused of injuring the town by talking about disease and defective drainage.

It is fortunate for the dwellers in growing towns that the power of town councils is not unlimited. Money cannot be borrowed without the consent of the Local Government Board. The Local Government Board may refuse to sanction a loan, and so defeat misguided attempts at sanitation ; but it is not the business of the Local Government Board to institute further inquiry, or to compel a town council to investigate and

rectify defects, the existence of which it has acknowledged by its action.

It has been said that "the present jumble of sanitary authorities "and the machinery of public health services at present existing is "inadequate to attain the purpose for which it was created." Has not the time arrived for the establishment in this country of a State Department of hygiene for the control and guidance of local sanitary authorities, the consolidation, interpretation, and enforcement of existing sanitary laws, and the general conservation of public health? Without the aid of such an institution will the prevention of disease in growing towns ever become a possibility? While we have it not, should not the voice of public opinion make itself heard, and declare with no uncertain sound against the settlement by town councils of large questions of sanitation, which they cannot by any sort of flattery be said to understand?

Ueber Desinfektion vom praktischen Standpunkte.

VON

Dr. M. Pistor, Berlin.

Dem Wunsche des verehrlichen Komité's dieser Sektion Folge gebend, gestatte ich mir die Aufmerksamkeit dieser hochansehnlichen Versammlung für eine der wichtigsten Aufgaben der öffentlichen Gesundheitspflege, die Ausführung der Desinfektion bei ansteckenden Krankheiten, in Anspruch zu nehmen. Dieses Thema ist zwar 1887 erst in Wien aus demselben Gesichtspunkte und im verflossenen Jahre in Bremen mehr theoretisch behandelt worden; die Handhabung der in Rede stehenden Massregeln hat aber bis dahin meines Erachtens keine Fortschritte gemacht.

Eine *gesetzliche* Regelung der Desinfektion auf Grund neuerer Forschungs-Ergebnisse besteht für keinen grösseren Staat; für Preussen ist noch heute die vollkommen veraltete Desinfektions-Anweisung vom 8 August 1835 bindend, und, nach dem Referat *in* Wien, die einzige *gesetzliche* Regelung der Sache überhaupt, da alle anderen derartigen mir bekannten Vorschriften lediglich Verordnungen ohne *bindende* Kraft sind.

Vorschriften zur Förderung der öffentlichen Gesundheitspflege müssen Gemeingut des Volkes werden, wenn sie dem Gemeinwohl nützen sollen: sie müssen deshalb bündig und klar verfasst sein, um gemeinverständlich zu werden und, unbeschadet der Sicherheit des Erfolges, mit den einfachsten unschädlichsten und wohlfeilsten Mitteln zu wirken streben. Kaum eine andere gesundheitspolizeiliche Massregel bedarf so sehr des Verständnisses und der Mitwirkung der Betroffenen, wie die Desinfektion, welche ohne einen in die Augen springenden Erfolg stets Belästigungen und Kosten für die Betheiligten im Gefolge hat. Alle darauf bezüglichen Vorschriften müssen daher den vorgedachten Forderungen besonders genügen.

Bevor ich mich den Desinfektionsmitteln zuwende, sei noch kurz bemerkt, dass ich für meinen Vortrag lediglich die Unschädlichmachung jener Mikroorganismen im Auge habe, welche vom Kranken auf den gesunden Menschen unmittelbar oder mittelbar (durch andere Personen, Nahrungsmittel, Gebrauchsgegenstände, &c.) ohne besondere persönliche Vorbedingungen (Alter, Geschlecht, Geschlechtsreife, Wunden, &c.) übertragen werden und durch ihre Verbreitung das Gemeinwohl gefährden, ich spreche also nur von der Desinfektion bei Volksseuchen.

Zu diesem Zwecke dürfen lediglich durch die Erfahrung sicher wirksam befundene Mittel in der Praxis zur Anwendung gelangen. Fürchten Sie, meine, Herren, keine theoretischen Auseinandersetzungen über Werth und Bedeutung der grossen Zahl der nach dieser Richtung empfohlenen Mittel; meine Thätigkeit bewegt sich am goldenen Baume des Lebens auf dem Boden der Wirklichkeit; die von berufenen Forschern zuverlässig gewonnenen Ergebnisse sollen hier kurz zur Geltung gebracht werden.

Zweifellos steht fest, dass Feuer, halbstündige Einwirkung der Siedehitze und strömender Wasserdampf von mindestens 100°C. bei ein viertel- bis halbstündiger Einwirkung sämmtliche Mikroben der hier in Rede stehenden Krankheiten unschädlich machen.

Von physikalischen Mitteln sind dann zu erwähnen die Herbeiführung grösster Reinlichkeit an dem Kranken, wie an seiner gesammten Umgebung einschliesslich des Krankenzimmers und seiner Ausstattung, welche durch Entfernung der Mikroorganismen und Fernhaltung einer weiteren Entwickelung derselben vorbeugend wirkt. Dazu gehört auch eine dauernde Lufterneuerung im Krankenzimmer selbst, nöthigenfalls, bei kalter Aussentemperatur, durch ein verhängtes Fenster.

Reinigung des Zimmers und der Mobilien wird am sichersten durch mechanische Mittel, anhaltendes Scheuern der Dielen, des Holzwerkes und trockenes Abreiben der Möbel, Bilderrahmen, &c. Putzen von metallenen Verzierungen, kräftiges Abreiben der tapezirten oder mit guter Leimfarbe getünchten Wände mit frischem Roggenbrot erreicht. Dass die seiner Zeit von mir vorgeschlagenen Brotabreibungen das erfolgreichste Reinigungsmittel für Wände dieser Art sind, haben von *Esmarch's* Untersuchungen erwiesen; ich gebe mich der Hoffnung hin, dass weitere Versuche meine Ansicht über die zuverlässige Unschädlichmachung der Ansteckungskeime durch *sorgfältige*, mit gehöriger Kraftanwendung verbundene mechanische Reinigung der angegebenen Art bestätigen werden. Damit, meine Herren, würde ein wesentlicher Schritt in der Vereinfachung des Desinfektionsverfahrens gethan sein.

Zu den chemischen Mitteln soll man meines Erachtens nur dann greifen, wenn die vorgenannten Mitteln keine Anwendung finden können, also in erster Linie zur Unschädlichmachung aller Auswurfsstoffe des Kranken (Erbrochenes, Stuhlgänge vielleicht Urin bei Cholera, Typhus, Ruhr, Genickstarre, Gelbfieber, Pest; Auswurf bei Tuberkulose, Diphtherie, Scharlach-Diphtherie, Masern, Pocken, Keuchhusten, ferner zur Reinigung der mit diesen Ausscheidungen besudelten Wäsche, &c. sofern man nicht halbstündiges Kochen in Wasser vorzieht;

das Sieden der Flüssigkeit muss aber wirklich eine halbe Stunde hindurch anhalten.

Unter den chemischen Mitteln ist die Karbolsäure in 2 bis 5°/$_0$ iger Lösung unbedingt das fast allerseits am meisten anerkannte; sie ist indessen giftig und, falls sie zur Desinfektion von Zimmern und Gebrauchsgegenständen benutzt wird, durch den lange haftenden Geruch für die Betroffenen unangenehm.

Die neuesten Untersuchungen haben nun festgestellt, dass die Laugen der Alkalien wie der alkalisehen Erden und die einfach kohlensauren Alkalien sehr wirksame Desinfektionsmittel sind, deren Erfolg nur durch Säuren beschränkt wird. Unter diesen Mitteln empfiehlt sich nach Pfuhl's, Behring's u.A. Versuchen, das Kalkhydrat in der Form einer etwa 20°/$_0$ igen Kalkmilch für die Desinfektion der Ausscheidungen des Kranken, wie des Latrineninhalter und von mit Wasser oder schlechter Leimfarbe getünchten Wände, sowie zweitens 1–2 prozentige heisse Lösungen der gereinigten (kalcinirten) Soda (die käufliche rohe Soda ist nicht brauchbar, da dieselbe bis zu 7·5°/$_0$ Natrium sulfuricum enthalten kann), des einfach kohlensauren Natriums zur Reinigung der Wäsche, Dielen, des Holzwerkes überhaupt, zur Reinigung der Hände und des Gesichts der Pfleger, &c. am meisten. Dass letztere ihre Kleidung ausserdem durch strömenden Wasserdampf reinigen lassen und ein möglichst warmes Seifenbad ebenso wie die Genesenen nehmen müssen, ist selbstverständlich. Vielleicht ergeben weitere Forschungen, dass auch die alkalischen Seifen volles Vertrauen verdienen.

Kalkmilch gewint man durch allmäliges Ablöschen von einem Theil gebrannten Kalk mit 4 Theilen Wasser in einer Schüssel oder dergl.; 1–1½ Liter Kalkhydrat soll nach Pfhul 100 Liter Latrinen- auch Tannin- Inhalt desinfiziren. Zu Ausscheidungen fügt man die Kalkmilch in solcher Menge, dass der Inhalt der Bettschüssel &c. nach *sorgfältiger* Mischung rothes Lackmus-Papier stark blau färbt. Die Tünchung der Wände findet nach Entfernung der zur Vermeidung von Staubentwitkelung vorher angefeuchteten alten Wandtünche statt.

Nach meinen Dafürhalten empfiehlt es sieh *auch* Bettstroh, dessen Verbrennung je nach der Oertlichkeit und bei grösseren Mengen nicht immer ausführbar ist, mit Kalmilch in grosser Menge zu übergiessen, durch Stampfen, &e., mit derselben zu vermisehen und dann auf den Düngerhaufen zu bringen, um dasselbe unschädlich zu machen.

Beide Mittel sind sehr wohfeil; es kosten in Deutschland

100 kilogram gebrannter Kalkstein 3,50 Mk.
100 „ kalcinirte Soda 19,00 „

während 100 „ Acid. carbolicum depuratum mit 90°/$_0$ reiner Säure welches allein zur Verwendung kommen kann, ca. 50 Mark kosten.

Bewähren sieh die vorgenannten Mittel in der Praxis, so würde die Karbolsäure nur noch für die Reinigung von Ledersachen Verwendung finden; die Leichen kann man getrost in mit Sodalösung getränkte Tucher hüllen.

Kurz sei nur noch bemerkt, dass ich den Sublimat nicht empfehle,—

1. weil derselbe durch eiweisshaltige und schwefelwasser-stoffhaltige Ausscheidungen unwirksam gemacht wird,
2. weil er sehr giftig ist und deshalb Laienhänden nicht überlassen werden darf.

Die Nutzlosigkeit der gasförmigen Chemikalien, Chlor, Brom und schweflige Säure darf ich wohl nur erwähnen, über die Wirksamkeit der Seifen und des Kurfersulfates müssen weitere Untersuchungen abgewartet werden. Die Anwendung des Chlor für unsere Zwecke ist überflussig.

Der vorstehend zusammengestellte Apparat erscheint auch mehr denn hinreichend, um bei sorgfältiger und verständiger Anwendung eine nach auch schlechten Verhältnissen zuverlässige Desinfektion zu erreichen; kurz noch einmal zusammengefasst,—

1. Peinlichste Reinlichkeit an jeder Stelle und zu jeder Zeit;
2. strömender Wasserdampf für alle Gebrauchsgegenstände, welche dafür geeignet sind;
3. halbstündiges Sieden in Wasser;
4. mechandische Reinigung von Möbeln, Holztheilen, Metall gegenständen, Wänden; für Letztere ev. Kalkmilchtünchung;
5. Behandlung aller Ausscheidungen der Kranken mit Kalkmilch;
6. Karbolsäure zur Reinigung von Ledersachen;
7. Heisse Sodalösung zum Waschen auch für betheiligte Menschen sowie zur Reinigung überhaupt.

Soll die Ausführung der Desinfektion zuverlässig sein, so müssen die Desinfektoren gehörig vorgebildet und auf ihre technische Fertigkeit amtlich geprüft sein; das beste Mittel bleibt in der Hand eines unkundigen oder unzuverlässigen Menschen wirkungslos, wie sich das in allen Verhältnissen zeigt.

Dass die Desinfektion des Krankenzimmers und seines Inhaltes gleichzeitig erfolgen muss, ist selbstredend.

Die Desinfektion ist durch Gesetz für jeden Krankheitsfall der in Rede stehenden Art verbindlich, für ihre Ausführung eine besimmte Persönlichkeit haftbar zu machen, anderenfalls bleibt der Erfolg aus; nur wenn bei allen derartigen Krankheitsfällen desinfizirt werden *muss*, kann eine möglichst zuverlässige Vernichtung der Mikroben erreicht werden. Der behandelnde Arzt soll in jeden solchen Krankheitsfall den Verpflichteten gegen Empfangsbescheinigung schriftlich zur Desinfektion auffordern, um die Ausrede der Unkenntniss von vornherein abzuschneiden. Die Kosten muss die Gemeinde tragen.

Ob nach allen oder nur einem Theil der als Volksseuchen bekannten Krankheiten unbedingt Desinfektion stattfinden soll, darüber muss nach den Umständen befunden werden.

Mit Rücksicht auf die nur kurze Zeit, welche die Sitzungen gewähren, musste ich mich auf dieses gedrängte Referat beschränken und stelle meine Ihnen gedruckt vorliegenden Schlussätze hiermit zur Erörterung.

The Prevention of Fever in India.

BY

Surgeon-General Sir William Moore, K.C.I.E., Q.H.P.

Fever throughout the Indian Empire is the most prevalent of all maladies, and had time allowed, I would have prefaced my observations on prevention with some account of the phases of fever met with in India. This, however, is impossible, so I at once proceed to prevention.

The prevention of fever must be considered under two heads:—

1st. What can be done by authoritative sanitary regulations?

2nd. What should be done in the matter of personal hygiene?

And it is desirable to consider these heads separately, as regards the Anglo-Indian resident, including the British soldier; and as respects the civil population.

In European stations and military cantonments much has been accomplished. Surface cleanliness is now almost perfect. Before I left India I heard a lady complain, that if her goat went out it could not pick up a straw! In many cantonments magnificent upper-storied barracks* have been built, generally with rooms for 12 to 25 men. Plunge baths, work and recreation rooms, have been provided, while conservancy arrangements — usually hand-work — are carefully supervised. In some stations better bungalows for officers have been built. Much, however, remains to be accomplished. For instance, the Queen's Regulations for the Army state, that no man shall go to the tropics until thoroughly drilled; practically this is not the case. Again, principally as a result of the short service system, men are sent out too young; and this, notwithstanding repeated recommendations that they should not be sent out until 22 years of age, and notwithstanding the fact that young men in India are excessively liable to fever, especially to enteric fever, which is more fatal in India than in Europe. Then the season of arrival in the tropics is (perhaps unavoidably) not always well chosen. For example, the "Crocodile" went out in the end of February last, and the "Euphrates" on the 9th of March, each having upwards of 1,000 troops on board. Next, arrangements should be made for men to be sent first to hill stations, or at least to selected stations, instead of their being invariably sent to the station where the regiment they are to join happens to be. A more free use should be

* These barracks, being built on a standard plan, are rather a mistake. For no one plan of barrack or house is suited to every varying climate of India. The climate demands modifications, which have not been sufficiently considered, or at least authorised.

made of the hills, especially for working-parties in the hot weather. But when Europeans go to the hills, greater care in the way of warm clothing is required *at once*, fever or diarrhœa often resulting imme diately from a mountain chill. Some military stations have been abandoned as too unhealthy, but there are still some notoriously unhealthy barracks and bungalows. Such should be abandoned at any cost. Barrack rooms should be so constructed as to admit of each man being partially screened from his neighbour. Over-ventilation is a most fertile cause of chill, and chill is a most prolific cause of fever. Over-ventilation should be guarded against as much as under-ventilation. Ventilation in barracks is often excessive. If the doors and windows are open the men sleep in a draught and get chilled;* if shut, the men breathe the emanations from their lungs and bodies. There should be small windows above each bed, and so protected that draught on the person is impossible, while the most thorough current is secured above. Subsoil drainage requires more attention. In few stations is there any subsoil drainage. But water passing through the subsoil under dwellings, and mounting by capillary attraction into plinths, is a matter seriously affecting health. Absolute disconnexion between the floors and the earth would be a substitute, but in the Bombay command there is not any barrack thus built. Neither is sufficient attention given to the construction of impervious shallow drains to carry away roof-water † from barracks and houses. The dry-earth system of conservancy is generally adopted. But men often neglect to use the earth, which use should be insisted upon, or self-acting hoppers should be supplied. In my opinion, a mixture of ashes, charcoal, and lime is superior to earth, as less of bulk is necessary, and such a mixture would tend to destroy germs, while earth is simply a deodoriser. But lime must not be brought into contact with urine, as ammoniacal gases are then evolved. In various localities where the natives will not yet use human ordure as manure, the mass is conveyed to some secluded spot, and deposited in pits, which is wrong.

In other localities it is buried in trenches, the ground being afterwards sometimes ploughed and sown. It has been frequently advanced that by this wholesale disposal of fæcal matter germs of disease may be placed in the soil to be liberated hereafter. I am strongly of opinion that every effort should be made to convert ordure into manure, and to induce the natives to use it for the fertilisation of the fields. It was mentioned that plunge baths had been provided. More strict orders should be enforced against men staying in the bath too long, which is frequently followed by fever or liver disease. Also, it should be insisted upon that men wash more thoroughly, for some do not wash the lower

* In the Report on Sanitary Progress in India for 1875, it is stated, that at Nusseerabad, fever admissions dropped suddenly from 953 per 1,000 to 430, after closing the windows at night to the prevailing wind.

† Roof water is supposed to be collected in iron vessels or chunamed pits, but the wind continually blows it on the adjacent ground, and the receptacles often run over.

parts of the body for days. A regimental wash-house for clothing should be provided, and native washermen should not be permitted to take clothing to their houses in the bazaars. Natives of India from experience know the value of the "cummerbund,"* and wearing a flannel belt over the whole of the abdomen and loins should be made obligatory; for a congested kidney is, I believe, not infrequently a cause of fever, and an abdominal chill may certainly be the immediate exciting cause of diarrhœa, dysentery, or even cholera. Arrangements should be made for a change of clothing when coming in perspiring from parade or exercise, instead of allowing the clothes to dry on the body in a draught The soldier goes too long without food. His meals are too close together. Provision should be made for an evening meal, and a less heavy dinner in the heat of the day.† A *free* ration should be given in the early morning of biscuit, bread, tea, cocoa, or still better, coffee, which is both stimulating and antiperiodic.

It is known that the temperature rises after food, although only in a small degree. An early morning meal was formerly supposed, in some mysterious manner, to prevent the noxious influence of malaria. But I say that the benefit resulting from the practice is consequent on its rendering the system less liable to be affected by the fresh chilly morning air. The men should not be allowed to supplement their rations with bazaar pork, for a condition resembling typhoid may be caused by trichinæ. It would be well if a bread-making machine were universally used instead of the unwashed sweaty hands of natives.‡ Much care is taken with regard to the milk supply, to which typhoid has been attributed. Unless Government take the milk supply into their own hands, it is difficult to see what more can be done. It may, however, be doubted if typhoid is caused by impure milk, for the women and children who consume more milk than the men, do not suffer much from this disease. A scorbutic taint is common, often regarded as malarious cachexia. This should be guarded against by a double ration of green vegetables whenever possible, for a scorbutic taint paves the way for fever.

It has been asserted that malarious fever may arise from drinking impure water. Whether this is correct or not, the old leathern "mussack" should be abolished from every barrack, as it has been from most; for, however pure the supply may be at the source, water is rendered impure by the mussack. Quinine or arsenic should be taken as a prophylactic during the feverish months. The jurisdiction of the military commandant and of his cantonment magistrate does not extend beyond the cantonment limits. He should have control, through the

* A cloth worn by the natives round the loins and bowels.

† Natives never eat if they can avoid it in the heat of the day, and those who use meat take less of it in the hot season. They also pay great attention to the state of the bowels, which is constantly neglected by Europeans.

‡ This is emphasised when it is recollected to what purpose the left hand of the native is applied.

cantonment magistrate, for at least two miles, over every village and bazaar. Especial control is necessary as respects the beverages sold in the bazaars.*

All the above is to be accomplished by authority, but classes for instruction in hygiene should be formed in every regiment or station. Men and officers should be taught how to take care of themselves. They should be taught the danger of unnecessary exposure to the sun, and to take the greatest care to protect the body from comparative cold and damp, which, especially in the form of colder night airs, dew, drenching rain, and sudden diurnal and seasonal changes of temperature, acting on a skin much excited and consequently debilitated by heat and perspiration, constitutes, if not the dreaded malaria itself, an agency quite as injurious.† They should also be taught that eating too much meat is likely to excite a plethoric, feverish state; that sleeping after a heavy meal, as many soldiers do, is detrimental to health, and that intemperance is generally a short road to the grave.‡

Lastly, I think the station hospital system is a mistake. The soldier, and especially the young soldier, should have the medical officer's eyes constantly upon him. And this is not possible unless there are regimental medical officers. In India early attention to slight ailment is required. An attack of fever may often be prevented. But soldiers will not apply to station hospitals with the freedom they do to a regimental one.

With reference to the general population, much of the foregoing is applicable. But more extended operations are required. The principal heads are subsoil drainage, for whenever water approaches a certain distance from the surface it generates damp. What is required in most localities is a lowering of the water level, and aeration of the soil round habitations. There are, however, some exceptions.§ Secondly, surface

* There is also another important point, viz., the prevention of venereal. Recently the House of Commons decided against the continued operation of the Contagious Disease Act in India, and venereal has, therefore, much increased. A large amount of the fevers European soldiers suffer from in India is either much aggravated by the syphilitic taint, or is purely syphilitic, which may assume an intermittent, remittent, or continued form. Similarly much of the liver disease originates from syphilis.

† Fever occurs at places and seasons free from all suspicion of malaria, and it has not been proved that appearances sometimes found in the blood of persons suffering from so-called malarious disease are introduced from without.

‡ Very recently the Military Medical Department issued a circular, giving plain instructions how to preserve health in India, which every soldier should be acquainted with, and should be made to thoroughly understand.

§ Such are the sandy, semi-desert districts of Western Rajpootana, where water is several hundred feet from the surface. Yet, notwithstanding this, and a very scanty rainfall, the sand is always damp a short distance below the surface, and this would not be obviated by subsoil drains. Sand is also hot by day and cold by night, thus exposing the people to great vicissitudes of temperature, and in this fact I suggest an explanation of the prevalence of fever in the semi-desert

drainage for the rapid removal of storm water by impervious conduits is required everywhere. In the extensive tracts of lands irrigated by raised canals* the problem has yet to be solved how efficient irrigation is to be combined with effective drainage. It is well known that irrigation in some districts has raised the level of the water in the wells, and rendered ground and habitations damp, which were previously dry; the consequence being much fever, often accompanied by pneumonia. When roads or railways are carried through the country greater care should be taken by the plentiful formation of culverts, that they do not act as artificial dams. Digging deep tanks in marshy localities, and raising the surrounding surface with the earth, which then forms good cultivatible ground, has been productive of much benefit. The cultivation of the eucalyptus and of the sun-flower has not been successful.

A pure water supply is a *sine quâ non.* Much has been done in this direction where the physical features of the country are favourable for storage. But much remains to be accomplished. Where physical features are not favourable, water should be conveyed by pipes from distant wells. Equalisation of the food supply throughout the country has been much favoured by railways and new roads. Formerly one district might be famine-stricken, while plenty reigned in the next, because there were no means of conveying food. For there were neither grass nor water for beasts of burden. Nothing conduces more to fever in India than insufficient food.†

There is also another important consideration. In the most feverish districts of India opium is used extensively as a prophylactic, and, as I believe, with good reason. It has been recently proposed to limit the use of opium to physicians' prescriptions. If this were done, I think the amount of fever among the poorer population would be alarmingly increased.

The principal causes of fever among the natives of India are to be found in a teeming population, working hard, and living scant, residing in ill-ventilated buildings, more or less destitute of drainage, and therefore damp, exposed to great solar heat and to wide diurnal and seasonal changes of temperature. Also in various unhealthy habits and customs. Among these are want of cleanliness in houses; washing in their houses on an earthern floor; washing in the open air perhaps in a cold wind;

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districts of India. Surgeon-General Cornish has noted the inapplicability of subsoil drainage to certain military stations in the Carnatic, where they suffer, not from too much moisture, but from excessive dryness of soil, and where during prolonged periods of drought subsoil pipes become blocked by deposits of ants, lizards, rats, &c., so that when they are really required no water flows.

* There are in British India 18,135 miles of irrigation canals, irrigating 12,098,000 acres.

† In connexion with food, salt should be mentioned. An increase of the salt duty lessened the consumption in 1888–89 considerably. The necessity of salt as an article of diet cannot be questioned, and it should be made as cheap as possible. From observation I think insufficient salt renders the person more liable to fever.

sleeping on the ground; garments not sufficient to protect them from changes of temperature, especially during the monsoon. Such habits must be abandoned, and the bulk of the people must have more food,* better dwellings, more suitable clothing, and some knowledge of hygiene, before we can hope for a material reduction of Indian fevers.

In the hands of microscopists and scientists, the tendency of the times is to refer, in common with many other maladies, to the operations of bacilli† or microbes, introduced from without. But it cannot be denied, that the febrile condition may arise from exposure to cold, from exposure to great heat, or to the sun, from digestive derangements, from fatigue, and from mental emotions. All admit that secondary attacks of so-called malarious fever, present, without any fresh exposure to malaria. And there are such maladies as rheumatic fever, traumatic fever without external wound, and, according to certain authorities, endogenetic puerperal fever. It seems reasonable to place fevers in the category of diseases, the causes of which are formed within us; probably by the retention of excretæ in the system, or by the imperfect transformation of tissue into normal excretæ, under the influence of chill,‡ fatigue, damp, overcrowding, scanty food, and various other causes. But even admitting that the *bacillus malariæ* and other microbes cause fevers, it must also be allowed that they are more frequently than not, destroyed by that *vis medicatrix naturæ*, which one of the latest theories regards as devouring cells (phagocytes). For microbes exist everywhere in nature, and according to the champions of the *bacillus malariæ*, it is *produced* in every so-called malarious country. We inspire and swallow microbes and bacilli in countless millions. I do not therefore consider that the prevention of fevers is to be accomplished by searching for germs, or by undertaking the futile task of endeavouring to prevent their entrance into the atmosphere and

* There is also a prevalent underlying scorbutic condition, often latent, which renders the people more liable to fever.

† With reference to the *bacillus malariæ*, it appears to have been forgotten, that malarious disease has prevailed on every variety of ground surface, even on bare rock. It is scarcely reasonable to presume that all kinds of soil produce this bacillus. In the semi-desert districts of India where the surface is sand, and the under-stratum sandstone; where there are no marshes and little vegetation; where there are no rivers; where the rainfall does not exceed five or six inches annually; and where water is hundreds of feet from the surface, malarious fevers are as prevalent as in the Concan, where the surface is black soil, where marshes abound, where vegetation is most luxuriant, where numerous rivers flow, where there may be 100 inches of rain, where water is three or four feet from the surface.

‡ Dr. Moir, I.M.S. has recently stated the case thus. (Ind. Med. Gaz. Feb. 91.) "The difference between the chill theory, and the specific micro-organism "theory is analagous to the difference between primary and secondary causes." The bacillus or some chemical product being the primary cause, exposure to chill, or to heat, or fatigue, being the secondary cause. This entails the belief that the organisms or their products lie dormant in the system until some change or excitement in the circulation liberates them. But I hold that chill, depression, fatigue, want, are sufficient to excite fever from a common cold to an ague fit or a remittent, especially in a tropical country, and in certain constitutions and temperaments.

bodily system.* The prevention of fever depends much more on strengthening the *vis medicatrix naturæ* by the various means I have named, than on any other measure. Every energy should be applied to the progress of general sanitation, to the diffusion of a knowledge of personal hygiene, and to the dispersion of the ignorance, fatalism, and caste prejudices of the majority of the natives of India, now so opposed to public health, and there would certainly be much less fever in that country. Although Government can and does insist on a large amount of outside sanitation, the State cannot interfere directly in the ordinary internal daily life of the people. I have not time to describe the lamentable unsanitary interior of a native house nor further to dilate on the habits of the people. But I feel sure, that with material and moral progress, there will be sanitary progress, and with sanitary progress fevers will diminish. Whether Indian fevers are due to paludal or telluric emanations, or to chill, or to both, all directions for their prevention tend to increase dryness of the climate, and thus lessen the sources of chill; or by clothing, nourishing food, avoidance of fatigue, and quinine, to prevent its operation.

In conclusion I attach some extracts showing that these views which I have long expressed are receiving more general acceptance, malaria especially being relegated to the back-ground.

In the memorandum of the Army Sanitary Commission for 1880, on the report of the sanitary officer for the Berars, it is stated, "The "fever deaths in the rainy period exceeded by a third the number in "the dry period. Temperature fell with the advent of rain, so that "this last element was the real cause apparently of the increase of "fever."

Dr. Little, the Sanitary Commissioner for the Berars, still more recently says, "Chill and insufficient clothing are the great factors in "its production . . . . . . a damp soil, with alterations of "temperature, causing increased evaporation, with day and night fluc-"tuations of heat and cold, and consequently chill." Another sanitary officer remarks, "The natives of India in their cotton garments are "exposed to rapid alternations of temperature, especially during the "monsoon months. If they had flannel socks, shoes, warm clothing, "and charpais to sleep upon, malaria would disappear." In a very recent annual report of the Sanitary Commissioner for Madras (Brigade-Surgeon Laing) it is stated, "There is no doubt that much of the fever "is due to the habits of the people." Dr. Gregg, Sanitary Commissioner for Bengal, remarks on "the poor people who for the most part "sleep on the ground, wear wet and insufficient clothing, and drink "impure water." Another official observes, "the one great cause of "fever throughout India is the existence of dampness, on and in, an "impure and foul surface and subsoil in inhabited areas." Dr. Weir,

* Klebs, the father of the *bacillus malaria* could suggest that no better preventive means than covering the surface of the ground with some impervious material, in order to prevent the bacilli ascending into the atmosphere, which is manifestly impracticable over a large area.

the health officer for Bombay, has quite recently remarked, " It is note-" worthy that the increased mortality from fevers is chiefly in the " suburbs, and in districts where population has rapidly advanced, and " where the advance of population has been greater than the advance " of works and channels, to carry away the moisture."

Some years back Syed Abdoollah published observations, " On the " cause and prevention of fever in India." The author described the ordinary native dwellings in Indian towns, the sadly ventilated and lighted yards and rooms, and absolute absence of drainage, the foul waste water of houses either discharged into a side gutter, and then allowed to evaporate, or where no such gutter exists, discharged into an earthen jar sunk at the side of the lane or street, and occasionally emptied on the nearest dunghill. Sometimes a hole dug in the side of the street is the receptacle of liquid refuse, while the contents of the masonry cesspools in the more wealthy natives' houses are, when full, thrown out indiscriminately over the thoroughfares to be absorbed or to evaporate. " Were it not for carrion crows, hungry pariah dogs, swine, and other " creatures which perform the office of scavengers, and for the extreme " dryness of the air, human life could scarcely be maintained under " such pestilent conditions. The nature and management of the water " supply is moreover a lamentably active cause of disease throughout " India." Syed Abdoollah considers that " the immediate cause of fever " is to be sought for in the dirt, poverty, and over-crowded condition " of the villages and towns, the filthy and unventilated state of the " dwellings; the close confined air of the dense jungles; and the " presence in the rainy season of large quantities of stagnant water " and decaying vegetable matter." In conclusion the author points out that free ventilation, scrupulous cleanliness, wholesome food, proper clothing, and abundant fuel, are matters which cannot be too strictly attended to, while the daily use of warm baths and the wearing of flannel are also considered safeguards against fever.

Mr. Stanley, at p. 31, Vol. 2. of "Darkest Africa," states, that when they travelled through the forest region they suffered less from fever than in the open country. But a halt in the forest clearings, reminded them they were not acclimated. On the plateau of Kavali, 4,500 feet high, there was much fever. When facing the wind on the Congo they were smitten with fever. Also when meeting the wind on the Aruwini. Yet notwithstanding all these facts, which tend to demonstrate that exposure to the wind and consequent chill is the cause of fever, Stanley goes on to say, "Hence we may infer that trees, tall " shrubbery, a high wall, or close screen interposed between the dwel" ling place and the wind currents, will mitigate their *malarial* in" fluence. The fact being that such obstacles mitigate the fall of " temperature caused by moving air."

DISCUSSION.

Surgeon-General Cook (Bombay), while recognising the great practical value of Sir W. Moore's paper, felt that as one who had much experience in Indian towns he could hardly allow the impression which would probably arise in the minds of many who had heard the paper read, that chill is the cause of malarial fever, to remain uncombatted. If it be accepted that chill is the cause, it would be unnecessary to further investigate scientifically its origin, or indeed to combat its causation, for chill is universal in all countries though malarial fevers are not.

No one who has seen the very remarkable phenomena of malarial fevers, their distinctive types, coming on at certain distinctive periods, daily, every other day, every third day, or every fourth day, and many of these varieties or types being endemic in certain localities, can believe that they are due to so simple a cause as chill. It is of course true that chill is a cause, but it is only the exciting cause, one that acting on a system already infected by the true cause, be it a germ or otherwise, so lowers the protective power of the system as to allow the injurious influence to prevail and thus to excite the return of fever.

Dr. Leduc (Nantes) said:—Je viens protester contre l'opinion de Sir W. Moore que la fièvre intermittente est produite par le refroidissement et le frisson, refroidissement favorisé par l'humidité de l'atmosphère des régions marécageuses. Sir Joseph Fayrer, dans les observations qu'il vient de nous présenter, me fournit la réfutation de l'opinion du Dr. Moore; il nous fait remarquer que la fièvre intermittente ne s'observa que dans les régions où se trouve de l'eau stagnante, et non dans celles où se trouve de l'eau courante; l'atmosphère de ces régions est pourtant également humide et favorise également le refroidissement.

La répartition de la fièvre intermittente dans les régions marécageuses nous montre que cette fièvre résulte de l'introduction dans l'économie d'un micro-organisme provenant des marais et très probablement du micro-organisme décrit dans la deuxième Section par Professeur Laveran de Paris.

Dr. Payne (London) said that he thought malarial fevers could not be due to chill. Why should chill produce them in other parts of the world? Our own country had a climate which was especially likely to cause chill, nevertheless the ague and malarial fevers were now quite extinct in this country. Also in Australia and New Zealand there was no malaria, though the climate showed great extremes of temperature. In London he had observed patients who had contracted malarial fevers by passing through malarial districts even without suffering from the disease at the time. This showed that something specific had been carried away from the soil by the patient. It was very reasonable to suppose that land drainage might extirpate malaria, not by altering the temperature, but by rendering the conditions unfit for the growth of certain organisms. Instances might be given of conspicuous animals and plants which had been exterminated in certain places by complete drainage; for instance, the great copper butterfly, which was formerly abundant in the fens of Cambridgeshire before they were drained, but is now quite extinct.

Surgeon-Major Pool apprehended that the cause of malarial fever of India in spite of bacteriological researches is still unknown; he did not believe it is due to chill alone. As for the use of opium as an article of diet advocated by Sir W. Moore, he did not wish it to go forth that

opium is necessary; it should be used as medicine only, as quinine is. As regards the station-hospital versus the regimental-surgeon system, he advocated a return to the old system, when the soldier looked upon the regimental surgeon as his friend, and often told him everything connected with himself and family.

Sir Joseph Fayrer, Dr. Walter Dickson, R.N., and **Surgeon-General Beatson** spoke on this subject.

The Principal and most Efficacious means of preventing the spread of Entozoal Affections in Man.

BY

DR. PROSPERO SONSINO, Pisa.

I wish to call the attention of this meeting to the prevention of a group of diseases which play an important part in the causation of the morbidity and mortality of mankind, especially in hot climates. I have undertaken to treat this subject with all the more pleasure, seeing that I am in this country and among you, gentlemen, to many of whom is still present the memory of a man whose busy scientific life, though unfortunately too short, was so much occupied with the prevention of entozoal affections. I may rightly say that no man has shown so much earnestness in solving the questions regarding this subject as the late Dr. Spencer Cobbold.

There are no diseases more preventible than the entozoal, provided we know sufficiently well in each case the manner of introduction of the entozoon which produces a given specific disease. Yet it seems to me that as much attention as it deserves is not generally given by hygienists to the subject. The number of internal zooparasites as yet observed in man, excluding some doubtful species, amounts to nearly fifty. But in this reckoning are comprised some small zooparasites of protozoal character which I will not refer to in this communication, as their manner of introduction to the human subject and their morbid action on their host are less known. Such are some amœbæ and cercomonas, a balantidium, some coccidia, and the more important hæmocytozoon, which, owing to the importance and wide distribution of the fevers originated by it, cannot be taken together with the ordinary entozoa. I shall limit, then, my consideration to the prevention of the diseases of man caused only by the entozoa which belong to the zoological class of vermes, with the exception of two species of pentastomum, which belong to the type of the arthropoda. Nay, I will restrict my consideration only to the more important of these, while I include those that are exotic as regards Europe in a synopsis indicating their respective geographical distribution.

First of all it will be convenient to indicate some general differences between the ordinary entozoa on the one hand, and the so-called micro-organisms on the other, in their relation to the bearer (man). These differences are of great importance, especially from the point of view of prevention.

The first difference to which I wish to call your attention is that entozoa coming from without never multiply indefinitely within the body of the bearer. Therefore, the effect on the bearer's organism is in relation to the number of individuals of an entozoon that may enter it. Micro-organisms, on the other hand, may enter the body only in small number, yet multiply there indefinitely. The case of trichina is not opposed to this rule for the entozoa, as the gravity of the infection is always proportioned to the number of muscle trichinæ swallowed, and if only one has been ingested, the infection in the muscles of man will be limited to the relatively small number of larvæ that can be produced by a single adult worm.

Another difference depends upon whether there is any individual predisposition offered or not by the higher organism to the life and welfare of the parasite; while for entozoa the predisposition is rather specific than individual, for the micro-organism it is necessarily both specific and individual. Put a man in the condition of swallowing a *Cysticercus cellulosæ*, and we can be sure that some time afterwards he will exhibit tænia solium. Let him ingest some living and ripe eggs of tænia solium, and we can be sure that he will be infected with *Cysticercus cellulosæ*. Let him ingest some larvæ of *Anchylostoma*, and he will become affected by *Anchylostomiasis*, provided that the larvæ have reached the degree of development necessary for a parasitic life. The same we may say of every entozoon without exception. But if we administer cysticercus cellulosæ to a species of animal not adapted to the life and well-being of this parasite, it will not grow into a tapeworm. Even the specific condition of the superior organism has often little to do with its infection by an entozoon. In many cases an entozoon does not take up its abode in an animal merely because there is no chance for reaching the intestine of this particular animal in its free stage. But granted that the free stage (egg or larval form) be artificially or accidentally introduced into the same animal, it may happen that development occurs in the new host. In this manner I succeeded in rearing in rabbits a certain species of echinostomum (*Distomum recurvatum*, Linstow), which is a parasite ordinarily found only in ducks. This I managed by introducing into a rabbit's stomach some molluscs (*Physa alexandrina*) that were infected by the encysted *cercaria* of the same echinostomum. We know that in Japan, Formosa, and Corea (Baelz and Manson) a fluke may take up its abode in the lungs of man, giving rise to a strange form of endemic hæmoptysis, and in the human brain giving rise to a form of Jacksonian epilepsy (Yamagiva). This fluke (*Distomum Ringeri*, or *Distomum pulmonum*) has only recently been found to be the same as the *Distomum Westermanni* found in the tiger (Leuckart). Thus we see that the same entozoon that finds

conditions suitable for its life in man lives even in a carnivorous animal, and that man is infected by it in those countries, probably only because he partakes in part of the same food or drink as the carnivora. Moreover, man may harbour in the gall ducts *Fasciola hepatica*, like the herbivorous mammalia, and *Distomum sinense*, a species which is found also in the cat. And this because man, being omnivorous, partakes at the same time of the habits of the herbivora and of the carnivora. What at first sight we may think is due only to specific disposition is due simply to the mere accident of the host's meeting with, or not meeting with, the parasite. But with the micro-organisms matters are otherwise. There is no doubt that everyone of us often introduces the tubercle bacillus into his lungs during inspiration, but the presence of this bacillus in our body is not always sufficient to develop into disease. Why not? Only because individual conditions, unfortunately too common, are necessary to offer a favourable soil for the development of this same bacillus. It is equally well known that many other micro-organisms, pathogenetic for man, are often found in the saliva of persons who still continue to enjoy very good health. Even of Koch's cholera comma bacillus, or spirillum, it has been said that there are many persons who have so good a stomach as to digest it. So we often see, in countries where cholera is endemic or epidemic, the disease attacking only some limited classes of persons who, owing to their peculiar habits of life, are weaker, and offer less resistance to the attacks of the parasite and a nutritive soil more adapted for its growth. With entozoa it is not the same. The strength and health of the bearer have no influence in hindering their development in his body, when they enter it in the stage favourable for development. Very possibly sickness and weakness in the host may in some instances be even inimical to the development of an entozoon, as in some rare instances they may be inimical to the development of a micro-organism. In the case of micro-organisms we often find a particular disposition associated with peculiar races or breeds of the same species of animal. So *Bacillus anthracis* is known to attack the white mouse less than other breeds of mice, and the Algerian breed of sheep less than other sheep. This we never find with the entozoa of man and domesticated animals, and I venture to assert that there is no example of an entozoon of man that cannot develop in all races of man. Bilharzia in Egypt is very common in natives, and is rare in Europeans; but this is not a case of a different predisposition due to race, because any European who drinks water without filtration in Egypt is just as subject to Bilharzia as a native. This is another important difference between entozoa and micro-organisms.

Finally, another difference, that is perhaps correlated to the foregoing, is that we can obtain immunity for certain diseases produced by micro-organisms by the so-called vaccinations, but there is no means of producing similar results in the case of entozoal diseases. We can draw, then, the inference that while for the entozoal diseases the main preventive measures rest upon preventing the entrance of a given stage of the entozoon into the body of man (which can be effected without great

difficulty, as we have to deal with bodies of a relatively large size), in the case of the micro-organisms, whose entrance we cannot always successfully hinder, we must rely principally upon acting on the individual organism and diminishing its predisposition to the development of each pathogenetic micro-parasite.

Restricting myself to the prevention of entozoal diseases, I must recall now for our purpose two practical divisions of the entozoa. One based upon their geographical distribution, by which entozoa may be divided, according as they are more or less diffused, into *cosmopolite* and *regional*, and into *indigenous* and *exotic* in Europe; the other upon the organ of the bearer's body in which the entozoon takes up its abode. The latter classification is especially based on the distinction between parasites living in the intestinal canal, and in parts that pour out their secretions into that canal (as the gall-ducts), or in any other parts communicating with the exterior; and parasites found in closed cavities, as the connective or other tissues of the body and the vascular system. It is clear that as regards *regional* entozoa, rules of prevention must concern only local conditions; and as regards intestinal entozoa, our main measures must rest on the destruction of the excreta that contain their eggs and embryos. If we throw a glance at the synopsis which I present to you,* showing the geographical distribution of the principal exotic entozoa of man, it appears at first view that they are confined to a certain number of countries which are certainly not the most advanced in civilisation. But apart from trichina (which, being especially observed in Europe and the United States of America, forms an exception, and which only shows that the more civilised peoples may still offer peculiar habits that are not always an indication of a more refined civilisation), and *Echinococcus*, *Anchylostoma*, *and Rhabdonema intestinale*, which are quite cosmopolitan, although the two latter are more frequent among the inhabitants of hot climates and peoples backward in civilisation, and the former largely diffused only among Icelanders, we see *Bilharzia hæmatobia* almost quite relegated in man to the African continent; *Filaria sanguinis hominis* (distinguished now by Dr. Manson into three different species—viz., *Filaria nocturna*, *Filaria perstans*, and *Filaria diurna*) affecting all the continents except Europe, principally Africa and Asia; *Distomum Ringeri*, *Distomum sinense*, and *Bothriocephalus Mansoni* relegated to the far eastern countries of Asia. Moreover, entozoal diseases we generally find more frequent among children than in adults; they are very common, too, in the insane. Both children and the insane are deficient in habits of cleanliness, which offers so great a preservative from infection by entozoa. It is said that Liebig measured the degree of civilisation of a people by the quantity of soap consumed per head of its population; and I think that the time will come when the degree of civilisation of a people will be estimated in proportion to the rarity of entozoal diseases among its members. Indeed, the main measures of prevention for the greater

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* *See* pages 344–5.

part of entozoa concern personal rules respecting the manner of living, eating, drinking, and washing, which generally agree pretty closely among the more refined civilised people.

The principal of these personal rules are the following:—

1. Pure spring water, or else boiled or filtered water, alone to be drunk. Drinking water to be preserved in good and well-covered vessels. River or lake water not to be imbibed while bathing. (This rule regards prevention especially from *Bilharzia hæmatobia*, *Filaria sanguinis hominis*, *Dracunculus medinensis*, *Rhzbdonema intestinale*, and probably also from *Filaria loa*, and many others.)

The relatively large dimensions of the eggs and larval stagé of entozoa hinder their passage with water through a good filter; therefore proper filtration of drinking water suffices.

That Bilharzia is taken in with drinking-water is demonstrated by the following evidence. In Egypt the disease is generally confined to the natives, and especially to rustics, who disregard the rule of filtering their drinking-water. I think that there is no evidence of a single person who, having always observed this rule, has yet become infected with Bilharzia. Filtration is, then, the great and principal preventive against Bilharzia. I have pointed out, ever since the year 1875, that the porous earthenware pitchers used in Egypt as recipients for water would serve very well as filters, if used in the European manner. But, strange to say, these vessels, which are found in every house in Egypt, are not generally utilised as filters. On the contrary, the filtered water which percolates through them is thrown away. They are used to cool the water or to store it, and the people drink what is left in the interior of the jar, the cooled water, in a concentrated state of impurity. I never succeeded in persuading any Egyptian rustic to use the " zir " as a filter.

In certain countries mosquitos, falling and dying in water, infect it with the larval stage of *Filaria sanguinis* (Manson); and other insects, as flies, might accidentally deposit in water the eggs of other worms picked up in their roaming about upon the ground; hence the advantage of keeping drinking-water in well-covered vessels.

In a paper published in the year 1875, I stated that some of my patients, afflicted with endemic hæmaturia from Bilharzia, told me that their disorder had originated after bathing in the Nile. I inferred then that Bilharzia may be taken in by swallowing water while bathing—a suspicion supported subsequently by observers in other countries (Guillemard and others). Nay, Dr. Rubidge, of Algoa Bay, said that he never met with a case of Bilharzia in boys who had not frequently bathed in the river at Port Elizabeth. From this it was inferred that the parasite gained entrance by the skin, or by the urethra, while bathing. This opinion is untenable, as I know persons, and among others women, who in Egypt acquired Bilharzia without having ever indulged in Nile or canal bathing. Guillemard rightly observes that the greater frequency of Bilharzia in boys and men than in women may be explained by the

different habits observed as regards bathing by the two sexes in tropical countries; but bathing induces Bilharzia disease only because water is swallowed while bathing. Thus Bilharzia forms no exception to the rule that the entozoa of man gain their entrance into the body of the bearer only in a passive manner by the mouth. The same we can say for *Dracunculus medinensis*, whose larval stage is swallowed in cyclops with water (Fedschenko).

Another entozoon that is certainly taken in with foul drinking-water is the *Rhabdonema intestinale*. This parasite, which, since it was first discovered in soldiers coming from Cochin - China (Normand and Bavay), has been found in some parts of Europe, is, I think (basing my assertion upon my own observations as well as on those of others), not quite innocuous. When a great many individuals infect the human organism, as I have seen in two cases, it may be the cause of an intense anæmia, and of enteritis, which may endanger life. The disease arising from Rhabdonema I proposed lately to call *Rhabdonemiasis*, following the rule adopted for the naming of other entozoal diseases.

2. Meat, fresh-water fish, and vegetables to be well cooked and kept from insects (flies). For children and invalids raw meat can be used, provided that it is well pounded and passed through a suitable sieve. (This rule regards prevention especially from *Trichina spiralis*, *Tænia solium*, *Tænia saginata*, *Bothriocephalus latus*, *Ascaris lumbricoides*, *Ascaris mystax*, *Distomum lanceolatum*, *Fasciola hepatica*, and others.)

It is well ascertained by experiments (Lewis, Pellizzari, Perroncito) that a temperature of about 60° C. (140° F.) is sufficient to kill both the muscle-trichinæ and the cysticerci found in meat. But it must be borne in mind that to impart that temperature to the interior of large pieces of meat, it is necessary to subject the surface to a higher temperature for some considerable time.

Respecting *Bothriocephalus latus* recent experiments (Max Braun's, Zchobbe's, Ernest Parona's) have demonstrated, what was for a long time suspected, that the larval form of this cestode is found in some fresh-water fish, and especially in *Esox lucius* (the pike), and in *Lota vulgaris* (burbot); whilst in Japan the intermediary host would be principally *Onchorhynchus Perrji*, a fish that is eaten there raw (Ijima).

The modern use of raw beef for children and invalids has been the cause of an extraordinary spread of *Tænia saginata*. But we need not put aside entirely this remedy, so valuable, especially in the wasting diseases of children and in chronic dysentery, on account of the risk of tænia infection, inasmuch as when raw meat is well pounded and passed through a fine sieve there is no fear that *Cysticercus bovis* may be conveyed still living to the patient.

3. Depraved tastes for substances not possessed of alimentary qualities (pica and geophagia) not to be yielded to. (This rule regards prevention especially from *Tænia nana*, *Tænia leptocephala*, *Tænia*

canina, and probably from *Distomum eterophies*, *Echinorhynchu hominis*, *Ascaris lumbricoides*, *A. mystax*.) Many of these entozoa have, or are suspected to have insects as intermediary hosts, which may be conveyed to the stomach of man through the habit of those affected by pica and geophagia of eating dirty things.

4. Special forms of food in use by the natives of countries possessing special entozoa to be avoided, or taken only after thorough cooking. (This rule is calculated to prevent *Bothriocephalus cordatus*, *B. Mansoni*, *Distomum crassum*, *Distomum eterophies*, *Distomum sinense*, and *Distomum Ringeri*.)

We know nothing of the life history of the foregoing entozoa. But it is very probable that they cannot be taken either with the drinking-water or with the ordinary food of every country, because they are only known within limited districts; and some of them are found in the lower animals as well, especially in the carnivora (as *Bothriocephalus Mansoni*, *Distomum sinense*, and *Distomum Ringeri*). Thus we are forced to think that the intermediary stage may, in the case of some of these parasites, be ingested with some alimentary substances special to those countries. And we know that the staple foods of Chinese and Japanese differ much from those of other countries.

5. Hands and nails to be kept thoroughly clean, particularly when about to eat. Domestic animals to be handled with caution, dogs especially. Caution in handling entozoa, their speedy and complete destruction by fire, whenever it is not necessary to preserve them for medical purposes. (This rule is of great importance, especially for preserving man from *Anchylostoma duodenale*, *Echinococcus*, *Pentastomum denticulatum*, *Tænia canina*, *Tænia solium*, and *Oxyuris vermicularis*.)

Anchylostoma is generally taken in by the hands being soiled with mud, in which the larvæ acquire a stage of development suitable for commencing a parasitic life. Anchylostoma occurs very frequently only in those classes of persons who handle mud much, as rustics generally do, and more particularly brickmakers, miners, &c. Thus in Egypt the very great prevalence of Anchylostoma is due to the general handling of mud by the natives in canal digging.

In handling dogs, man may attach to his hands the eggs of *Tænia echinococcus* and of *Pentastomum tænioides* and convey them to his stomach when eating. Handling entozoa which spontaneously quit the body of their host, as *Oxyuris vermicularis* and *Tænia solium*, may cause infection.

6. The body to be sedulously kept clear of epizoa (mosquitos, bugs, fleas, etc.). (This rule is of great importance in guarding against some of the above-mentioned worms, so as to interfere with the life-cycle of those parasites as well as with that of several of the filariæ.)

The intervention of State hygiene may contribute on a larger scale to the destruction of the eggs and embryos of the entozoa. The most efficient of all the measures that could be taken by the State would be the general destruction of the fæces and of all the excreta of man by

heat (cremation) if possible, or their thorough disinfection. If we keep in mind that about half the entozoa of man are intestinal, and that their diffusion in the outer world is made exclusively in fæces, we can easily conceive of what importance and efficiency would be the general adoption of such a measure. But the benefit that this would confer on mankind is not limited to the deliverance from many entozoa, as it would bring about also the destruction of all the micro-organisms that are spread with the fæces, and also of their toxic products, which otherwise may again poison our organism if they contaminate drinking-water. A temperature of 50° C. of five minutes' duration is sufficient to kill both eggs and embryos of Anchylostoma (Perroncito). I admit that for other entozoa a slightly higher temperature may be necessary; but we can be sure that there is no egg or larva of entozoa that can withstand with impunity the temperature of boiling water. Then baking, if not complete cremation, of fæces would be, without doubt, the most efficient expedient for dealing with them in view of destroying the eggs and larvæ of the intestinal entozoa. Nay, I would say it would satisfy the utmost desideratum of hygienists, and its realisation would indicate the greatest advance of civilisation in the mode of disposing of our excreta and of our dead bodies. But such a measure in a general way is as yet too difficult of realisation, both on account of injuring agricultural interests and being too expensive in its application. If we can find a cheap and convenient disinfectant, it would probably be adopted with less difficulty. Entozoal eggs have a shell provided with chitine, a substance very resistant to reagents. Yet allow me, gentlemen, to think that all that has been said about the resistance of entozoal eggs to the action of reagents must be accepted with reserve, because there is no doubt that the shell is permeable to fluids, so that its contents are rendered amenable to the influence of noxious fluids. In fact, the Ascaris eggs, which possess great powers of resistance, on account of having a very thick shell, when kept for a long time in urine or in putrefying matter, ultimately lose their power of development—*i.e.*, die (Davaine). Certainly many nematode eggs can undergo complete dessication with impunity; only their development is arrested if they are deprived of a damp environment; moist air is sufficient, and is, perhaps, more efficient than liquid water (Leuckart). But that the eggs of certain nematodes, with thick shells, like Ascaris, possess such an extraordinary power of resistance as to be able to support without injury to the development of the embryo even immersion in spirit or chromic acid, as is said by some old experimenters, I am a little incredulous. That is an assertion that recalls to me the story of ancestral wheat found in the Pyramids said to be capable of germinating. Against those observations we can affirm that concentrated alcohol and chromic acid have a coagulating action on albumen, and, penetrating into the eggs, must exercise their powers of destruction on the animal cell.

On the other hand, we see that, though the eggs of entozoa offer great resistance to the action of external agents, they are more or less liable to decay under certain conditions. Thus it is notorious that eggs

and embryos of Bilharzia do not withstand long the action of decomposing urine ; and this fact has a very important bearing from the point of view of prevention. Eggs of Ascaris, as I hinted before, kept for a long time in urine or putrefying matters, finish by losing their power of development; and as for the eggs of Anchylostoma, my experiments assured me that, left in fæces alone for a certain number of days, even five days only, they all perish. As regards the eggs of *Tænia solium* and *Tænia saginata*, and other thick-shelled eggs, I have no clear notion about their spontaneous decay ; but we can say in a general way that, by hindering the introduction of fresh eggs into water and earth, we facilitate greatly their destruction, and thereby diminish much the spread of entozoa in man. Hence the usefulness of suitable latrine arrangements in preventing the spread of entozoa. But in hygiene *melius abundare* is a good motto; and we must therefore search for a convenient disinfectant of even eggs and embryos of entozoa, applicable in certain special circumstances, if not as a general means of treating human fæces. Quicklime would offer the great advantage of cheapness. It suffices to say that on the Continent its cost may be calculated on an average at 15 francs per ton. It is, indeed, impossible to find a cheaper substance for disinfection purposes. In recent books of hygiene (Flugge, De Giaxa), quicklime is suggested for disinfection of the fæces in the proportion of 1 or 2 per cent. to the fæces. But I fear much from all that I know that such a proportion is insufficient to kill the entozoal eggs. The suitability of quicklime as a disinfectant rests, I think, on its action of absorbing water, and even more on its power of evolving heat. But to elicit this action efficiently it is necessary to use quicklime in a very large proportion. It could not be suggested as an efficient disinfectant of fæces unless mixed in such a proportion to the fæcal matters as to raise the temperature of the mixture to such a degree as to kill the eggs by heat. To be sure of its acting in this way the temperature should be about that of boiling water. To employ it in such proportions offers many drawbacks. Sulphuric acid has been found a good killer of the eggs and larvæ of Anchylostoma (Perroncito and Schopf), and it is generally known that while in the workmen of the Schemnitz mines Anchylostoma was common, it was not found in those of the neighbouring Kremnitz mines, and this fact can only be explained by the presence of sulphuric acid in the stagnant water in the galleries of the latter mines. I have recently made some experiments with sulphuric acid which confirm its efficacy, attested by previous observers. I took the fæces containing eggs of Ascaris and Anchylostoma, and teased them on two glass slides. One as a control specimen was merely covered with a cover-glass and left to itself. To the other, before covering it, the disinfectant (sulphuric acid at 10 per cent.) was added. Evidence that the eggs had died was easily afforded in the case of Anchylostoma eggs by seeing that the mass of the vitellus or the embryos had shrivelled, or that (the preparation having been left for one or two days) I did not find any living embryo within or without the eggs. As for Ascaris, the evidence is more difficult, the eggs of Ascaris not offering segmentation

and the formation of the embryo so soon as those of Anchylostoma. Still one thing I observed, that sulphuric acid deprives the eggs of their external coat of the shell, and there are grounds for believing that eggs deprived of that coat are incapable of development. In conclusion, it may be said that sulphuric acid can be used with more convenience and effect than quicklime, and therefore is to be recommended.

The destruction of urine and expectoration has no great importance in respect to the prevention of entozoal diseases, as it has relation only with few parasites, especially ***Bilharzia hæmatobia*** and ***Distomum Ringeri***. Respecting urine, it would be of great importance to hinder the pouring of fresh urine into the water-courses, rivers, or canals; but it is almost impossible to enforce the actual observance of this rule by State provision.

Of chief importance for the prevention of the entozoal diseases is the public measure of procuring good spring drinking-water for the use of the population. But I need not dwell upon the necessity of a good drinking-water for a community, as it is a measure of the first importance for the prevention of many other diseases, and constitutes the basis of all good systems of sanitation. It being difficult nowadays to obtain the destruction of all eggs and larvæ of intestinal entozoa by the general cremation of the fæces, it is necessary to be satisfied with the following measures, which should be rendered obligatory by the Boards of Health of all countries where State action may be exercised in the cause of sanitation.

1. The discharge of sewers, where possible, must be into the sea. I know that this measure is opposed to agricultural interests, but in this question safety is the first thing to be sought, and profit must come afterwards (Parkes). In seaports the outfall of the sewers must be outside the port and far from dwelling-places, and, better, the discharges transported by sewage boats be thrown into the high sea. When it is not possible to throw the excreta into the sea, as in inland places, they must never be thrown into rivers. Irrigation systems would be safe certainly, provided that the irrigated soil be cultivated only with vegetables that are used as cooked food (De Giaxa), or, still better, with anything that it is not intended to afford food, either for man or for feeding domestic animals. Otherwise irrigation systems with previous efficient disinfection of the sewage must be resorted to.

Many of you, gentlemen, remember the discussion which, some twenty years ago, arose about the danger of sewage irrigation as a cause of the spread of entozoa in man. It was opposed to the late Dr. Cobbold that there were no arguments showing that sewage irrigation of the soil had contributed to augment the spread of the entozoa in man. But Dr. Cobbold rightly replied that statistics afforded little assistance in calculating the relative frequency of the entozoal diseases and of the deaths produced by them, as in the greater number of cases entozoal diseases do not figure at all in these statistics, being registered as common diseases, and under other designations. Yet the fact exists that some worms that are taken with vegetable food, are more frequent in the

country than in the town, it being more easy to procure and eat unwashed fresh vegetables in the country.

2. Whenever the first measure is not applicable, and general destruction or disinfection of fæces cannot be practised, the disinfection at least of fæces in such institutions as hospitals, asylums, and schools—these being places where fæcal matters are more frequently and more extensively contaminated with eggs and larvæ of entozoa—must be prescribed. This disinfection must be effected by heat or by some very efficient disinfectant, such as sulphuric acid (10 per cent.) or great quantities of quicklime.

3. Interdiction of nuisances, especially in certain places of labour—as brickfields, mines, tunnels, railway embankments, digging of canals, rice, coffee, tea plantations, with provision in those places of special forms of latrine and tanks to receive the excreta for disinfection. Microscopical examinations of fæces in the case of workmen before their admission into such works as tunnels and mines—an examination which must be repeated at regular periods, in order to eliminate from these places of labour those that are found infected, and to cure them before re-admission.

4. Prescription of daily veterinary inspection in the slaughter-houses (for trichina and measles especially). Cremation of all organs or part of organs of slaughtered animals offering or containing entozoa. "All entozoa not preserved for scientific investigation or experiment " should be destroyed by fire, and under no circumstances whatever " should they be thrown aside as harmless refuse." (It is fair to say that the last clause of this rule is quoted from a paper by the late Dr. Cobbold, read at the Cambridge meeting of the British Association in 1862.)

5. Afford facility of admission into the hospitals to the patients of entozoal maladies in order to cure them.

6. Licensing of pigsties. (These measures would diminish the spread of trichina and measles in swine and indirectly in man.)

7. The general destruction of ownerless dogs and their removal from slaughter-houses. (This measure is with a view specially to the diminution of the entozoa of man that accomplish their life cycle in dogs, as *Echinococcus* and *Pentastomum denticulatum*.)

8. Providing latrines, not only in towns, but also throughout the country, along the roads, even far from dwelling-places. (This is certainly of great importance, as it would contribute much to diminish the contamination of soil and water with the fresh eggs and larvæ of entozoa.)

These are the means both of a personal and of public character which I think the most useful and efficient in restraining the spread of entozoal affections in man. I think that they are all applicable, and that hygienists cannot exert themselves too much to obtain their thorough application. Nay, many of them are already entered in the ordinary rules of sanitation of the best regulated and most civilised communities. But my aim has been especially to describe the principal and most

effective means of preventing the spread of entozoal diseases in those countries where they are most frequent, most formidable, and play a more important part in the morbidity and mortality of man. Those countries are especially the hot countries of tropical and subtropical regions, of one of which particularly I could speak from long experience during a sojourn of twelve years. I mean Egypt, where *Anchylostoma duodenale*, *Filaria sanguinis*, and *Bilharzia hæmatobia*, as I have said on many previous occasions, play together a very important part in the generation of diseases of man, and concur in the production of a large mortality of the natives. I will add now that it is probable, and I suspect much, that to the pernicious influence of those three entozoa should be added that of another—viz., *Rhabdonema intestinale*,—which, being the cause of a peculiar anæmia with specific enteritis, is often confounded with Anchylostoma affection. But, just as in Egypt, we have many other countries of Africa, Asia, and South America where the ravages from entozoal diseases, though not attested by statistics, are not less formidable. I will recall to you the African negro cachexy, known for a long time as very common among the natives of Western Africa and the slaves in the West Indian colonies, which is in great part the result of the presence of Anchylostoma. Also, I would mention another scourge of tropical climates, mistaken for and often described under the colloquial term of *Beri-beri*, which is frequently really a compound distemper, a great element of which is the anæmia from Anchylostoma, as has been discovered recently in the so-called *Beri-beri* of Ceylon (Kynsey), and of Assam (Giles). I will also recall to you, chyluria, lymphocele, lymph-scrotum, and many other similar disorders that arise from the alterations and occlusions of the lymphatic vessels, particularly of the thoracic duct, which are caused by the presence of *Filaria sanguinis;* and the formidable disease of Western Africa called *sleeping sickness*, which Dr. Manson now thinks to be caused possibly by the new *Filaria perstans*. I will lastly recall to you the no less formidable disorders to which Africans are subject from the presence of Bilharzia in the abdominal veins, disorders that begin with a simple and apparently harmless hæmaturia, and which subsequently assume often characters of more gravity, leading to cystitis, pyelo-nephritis, ectasis of the ureters, hydronephrosis, perineal fistula (Mackie), and urinary calculus, with all the torture and distress which accompany urinary diseases, curtailing the best energies of man and displaying, too, a detrimental influence on the growth and welfare of communities. Thus, in conclusion, Anchylostoma, Filariæ, and Bilharzia, are veritable scourges to mankind, a kind of scourges that does not destroy at once like cholera or plague, but decimates slowly and deteriorates entire populations like malaria. To these scourges particularly I wish to call your attention, with a view to devising means for their prevention.

Synopsis of the Exotic Entozoa of Man, with their Geographical Distribution.

Name of the Entozoon.	Asia.	Oceania.	Africa.	America.	Observations.
(1.) TÆNIA MADAGASCARIENSIS, *Davaine* (*)	Bankock, Siam (*Leuckart*)	—	Mayotte (*Grénet*).—Mauritius (*Chevreau*).	—	—
(2.) BOTHRIOCEPHALUS CORDATUS, *Leuckart* (*)	—	—	—	Greenland	—
(3.) BOTHRIOCEPHALUS MANSONI, *Cobbold* (***)	China (*Manson*)—Japan (*Scheube, Ijima*).	—	—	—	Known only in the larval stage. Probably the same species as that found in *Canis aureus* (Jackal) in Egypt by Sonsino.
(4.) DISTOMUM RINGERI *Cobbold* (**)	Formosa (*Manson, Ringer*)—Japan (*Baelz, Taylor, Ijima*).	—	—	—	Lately found by Yamagiva encysted in brain, having caused the Jacksonian epilepsy.
(5.) DISTOMUM HETEROPHIES, *von Siebold* (*)	—	—	Egypt (*Bilharz*)	—	—
(6.) DISTOMUM BUSKI *Lancaster* (*)	China (*Busk* in a Lascar —*Kerr* at Canton—*Cobbold* in persons from Ningpo. *Sinclair* in Chinese at Borneo.	—	—	—	—
(7.) DISTOMUM SINENSE, *Cobbold* (**)	China and Corea (*MacConnell* at Calcutta, in Chinese—*Macgregor* at Mauritius, in Chinese) —Japan (*Baelz, Scheube*) — Tonkin (*Grall, Caraës, Vallot, R. Blanchard*) — Bengal? (*Pfihl*).	—	—	—	Found, too, in cats in China — identified by Sonsino.
(8.) DISTOMUM CONJUNCTUM, *Cobbold* (**)	India (*MacConnell*)	—	—	—	Found by Cobbold in an American fox which died in London, and by Lewis in dogs at Calcutta. Very probably the same as *Distomum sinense* (*Sonsino*).
(9.) BILHARZIA HÆMATOBIA, *Cobbold* (***)	Arabian Coast of Red Sea?	—	Egypt (*Bilharz* and others).—Cape Colony (*John Harley*). Kaffraria and Natal (*Cobbold*).—Nearly all the east coast of Africa, with the adjacent isles. —On the Gold Coast in Western Africa (*Eyles* and *Eden*).—White Nile between 6°, and the Albert Nyanza (*Felkin*). —Chad and adjacent countries? (*Nachtigal*). —Tunisia (*Villeneuve, Brault*).	—	Nachtigal's verbal communication attested only the existence of endemic hæmaturia in Lake Chad and adjacent countries, but it has not actually demonstrated the existence of Bilharzia in those districts. Berkeley Hill in 1888 spoke of Bilharzia in two persons living wholly in England. Bilharzia was found by Cobbold in *Cercopithecus fuliginosus*, which died in London. *Bilharzia crassa* found by Sonsino at Zagazig (Egypt) both in oxen and in sheep; is still doubtful whether it is a different species from that of man. Bilharzia in oxen was found, too, at Calcutta, by Bomford, and in sheep, near Catania, by Grassi.

SYNOPSIS OF THE EXOTIC ENTOZOA OF MAN, WITH THEIR GEOGRAPHICAL DISTRIBUTION—*continued.*

Name of the Entozoon.	Asia.	Oceania.	Africa.	America.	Observations.
(10.) AMPHISTOMUM HOMINIS, *Lewis and MacConnell* (*)	India (*Lewis* and *MacConnell*).	—	—	—	—
(11.) DRACUNCULUS MEDINENSIS, *Lin.* (**)	Arabia, Persia, Turkestan, India.	—	Guinea, Senegambia, Darfoor, Senaar, Abyssinia, Nubia, Egypt.	West Indies, Brazil, Guiana.	—
(12.) FILARIA SANGUINIS HOMINIS, *Lewis* (*)	India (*Lewis*) — China (*Manson*) — Japan (*Scheube*, *Beukema*, *Baelz*).	Queensland (*Bancroft* of Brisbane).	Egypt (*Sonsino*, 1874).—Soudan—Algeria? (*Cauvet*, 1876).—Shores of the Zambesi and Lake Nyassa, Zanzibar coast (*Felkin*). — Mauritius. Mayotte. West Africa?	West Indies (*Demarquay*, *Crevaud*, and others). Brazil (*Wucherer*, *Silva Araujo*, *Magalhaes*, and others).—Southern portion of the United States, Charleston, S. Carolina (*Guitéras*).—Mobile, Alabama (*Wm. M. Mastin*). Guiana (*Winckel*). — Buenos-Ayres (*Wernicke*).	The first relation on the embryos of this filaria belongs to Demarquay of Paris, who found it in hydrocele of man from Havana, 1863. Lewis discovered it at Calcutta in 1872 *in blood*. Adult worm found almost in the same time by Bancroft. Carter, and Lewis. Cauvet's singular observation may belong to an individual who has taken the infection in other country than Algeria.
(13.) FILARIA DIURNA, *Manson* (*)	—	—	Congo, Old Calabar (*Manson*).	—	The specificity of this and of the following filaria rests on the recent observations of Manson, and it is founded only on the characters of the embryos, the only stage known at present.
(14.) FILARIA PERSTANS *Manson* (*)	—	—	Congo, Old Calabar (*Manson*).	—	The cause of sleeping sickness and perhaps of craw-craw (*Manson*).
(15.) FILARIA LOA, *Guyot* (*)	—	—	West Coast of Africa, Guinea, Angola, Gaboon, Congo.	Guiana and West Indies, only in African negroes.	Supposed by Manson to be the adult stage of *filaria diurna*.
(16.) PENTASOMUM CONSTRICTUM, *von Siebold* (**)	—	—	Egypt (*Pruner*, *Bilharz*, *Fenger*). — Bathurst, Gambia, and other places in Western Africa (*Kearney*, *Crawford*).	—	Known only in the larval stage. Found in necropsies of negroes in Cairo, and probably indigenous to the Soudan and not to Egypt; also found in the giraffe (*Pruner*).

(*) One asterisk indicates that the entozoon was found in man only. (**) Two asterisks indicate that the entozoon was found in man and animal. (***) Three asterisks indicate that it is doubtful whether it was found only in man, or in both man and animal.

Cholera in Egypt.

BY

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From a date some two hundred years before the Christian era and until 1844 A.D., Egypt was well known as one of the favourite lurking places of the Black Death or Plague, and before she had fully shaken off the liability to this pestilence, she found herself attacked by another, almost as terrible in its fatality, and in its general distribution.

In 1817 or a few years earlier, cholera in an epidemic form first spread over India, and seems not to have travelled westward to Arabia, Persia, and Syria until 1821–22.*

1831. In November 1828, it was again in Arabia, and in the spring of 1831, cholera spread a third time to Mesopotamia and Arabia, and from those countries it was carried by bands of pilgrims to Syria and Palestine, and also by way of Suez to Egypt. It appeared in Cairo in July, spread up the Nile to Luxor, and broke out in August in Alexandria, causing the European consuls to put such pressure on the Viceroy that quarantine stations and laws were at once agreed upon. This first epidemic in Cairo lasted till the end of October during the summer months; the total number of deaths from all causes in Cairo reached 55,000 (36,000 from cholera) the mortality on one day being reported as 2,500.† Mussulman resignation was of no avail against this evidence of Heaven's displeasure, and those who had philosophically endured the Plague fled ignominiously towards the sea, or up the Nile to Nubia.‡

1834. Dr. Clot Bey, the head of the Sanitary Department of Egypt, writes of a cholera epidemic in Cairo in 1834 and of yet another in 1840,§ but says that they were much milder than that of 1831. There is no official record of these two outbreaks, but Clot Bey says that 400,000 in the provinces and 30,000 in Cairo died of the Plague during six months of 1834. It may be noticed here that steam communication between India and Egypt began in March 1830, the "Hugh Lindsay" then taking 32 days to make Suez from Bombay.

1837. Egypt was visited a third time by cholera in September 1837,|| a few months before the scourge was to leave Europe, Africa,

* "As the epidemic was threatening to enter Egypt through Syria, the Pasha applied to the Supreme Board of Health of Paris for directions by which the fatal junction of the Indian cholera with the plague might be prevented in the Valley of the Nile."—*History of Asiatic Cholera by Macnamara.* 1876, page 64.

† "Three-fourths of the pilgrims are calculated to have perished during the three days they were densely crowded together at Mecca, and of the fugitives 10,000 fell victims on their journey. Egypt lost on the whole 150,000."—*Dr. Graves' Clinical Lectures.* 1848. Vol. i., page 397.

‡ Dr. Clot Bey. Dr. Chamas. T. Colucci Bey.

§ Les épidémies de choléra du Caire de 1834, 1840, et 1848. M. Clot Bey. Paris.

|| Hirsch and others. Dr. Néroutsos Bey.

and America completely free for a period of at least 10 years. Upon this occasion the outbreak was apparently the continuation of a progress through Tripoli and Tunis, and spreading to Abyssinia, Zanzibar, and the Soudan. The epidemic was a mild one, and it is to be noted that it did not occur at a time of year when pilgrims were certainly in movement.

1848. In May 1846, cholera showed itself at Aden, Mocha, and Jeddah, thence spread into Syria, and appeared among the pilgrims at Mecca in November. In January 1847, "2,000–3,000 of them are re-" ported to have perished by it in the one night of their pilgrimage " from Mecca to Mount Arafat."* In the following autumn and spring cholera was at Constantinople, and seems to have spread from Turkey over Syria and Egypt, and thence travelled as far as Morocco. (Hirsch). But as it had burst out again at Mecca† and Medina in April 1848, it may very easily have entered Egypt with some returning pilgrims. The accounts‡ that I have read say that it broke out in Egypt on June 24 at the Tantah fair, which was attended by many pilgrims, swelling the crowd to 195,000. Of these, 3,000 died at Tantah, and this outbreak is still named after the patron saint of that fair; 300 died daily in Cairo (July 15 to end of August), almost as many in Alexandria, and the whole number of victims was about 20,000.

1849. Hirsch, without giving details, states that cholera was again present in Egypt in 1849.

1850. Towards the end of June 1850, cholera again appeared in Cairo on the arrival of some pilgrims from Mecca, and it lasted until the beginning of August, the cholera deaths reaching 212 per day.§ At that time there was no railway between Suez and Cairo, and the pilgrims used to encamp in great numbers near Cairo. As a consequence of this outbreak, the Sanitary Department of Egypt obtained fresh powers for enforcing quarantine, hygiene, and medical reforms.

1855. On May 26th, 1855, cholera again broke out in Cairo on the return of some pilgrims from Mecca, the earliest deaths taking place at Boulak among the pilgrims. The maximum number of deaths‖ from cholera in Cairo was 350 on June 15th, and the scourge came to an end there on July 9th, not, however, before it had spread to Nubia and through Northern Africa to Morocco. The total cholera mortality this year was 26,145. It should be remembered that the pilgrimage to Mecca and the return journey are fixed by the varying Mussulman months, which accounts for the apparent discrepancy in dates of the various epidemics.

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* Report of Board of Health on Cholera. London, 1850.

† Cholera Conference of Constantinople. Calcutta, 1868, page 764.

‡ Considérations sur le Choléra par Dr. Willemin. Strasbourg, 1866, page 13. M. Colucci Bey.

§ I am indebted for some of my historical notes to a friend's paper which has been printed, but not yet published.

‖ Cholera mortality in Cairo, 4063. M. Colucci Bey.

There are records of five severe cholera epidemics in Arabia between the years 1854 and 1862, and the west coast seems to have been always the most severely visited, while Syria was overrun by the disease in the years 1859–61.

1865. The fourth pandemic of cholera in the world's history began in 1863 and came to an end in 1875, embracing as is usual a period of more than 10 years. It was distinguished from all previous cholera pandemics by the speed with which it travelled from Asia to Europe, taking only a few days to reach Europe by sea from the coast of Arabia and only a few weeks to overrun the south of Europe.* About the beginning of 1865 the disease was brought on board ship from the Bombay coast to South Arabia and to Somali Land. In April or in the first days of May, during the religious fêtes, it broke out in Mecca among the 100,000 faithful, causing a panic and general flight and dispersion of the poison along the tracks of the homeward bound pilgrims. At Suez a vessel arrived on May 19th from Jeddah with choleraic pilgrims belonging to Egypt and the rest of North Africa. There were 1,500 on board, and the captain and his wife were attacked with cholera on May 21st at Suez. The pilgrims underwent medical inspection at Suez, and were conveyed to Alexandria in special quarantine trains,† and were there encamped in the desert by the sea shore. Notwithstanding precautions, cholera broke out among the railway employés at Alexandria on June 2nd, and by June 17th had spread to Aboukir, Tantah and Cairo. A week later it appeared at Rosetta, Damietta, and Mansourah, towns with which there was then no railway communication, and travelled up the Nile to Minich, and to the Soudan, Suakim, and Kassala. Dr. Néroutsos gives 62,000 as the number of deaths from cholera in Egypt, besides all those not officially registered, (Colucci Bey gives 80,000). The deaths at Cairo from June 17th to the end of September, when the epidemic disappeared, were 12,429 from all causes, the maximum cholera mortality having been 468 on July 5th.‡

In July cholera seems to have been carried directly from Alexandria by ships to Constantinople, Italy, and Spain, no less than 35,000 people having fled from Egypt during 30 days. In Arabia itself the pestilence had spread into the Nejd, and was prevalent there again the following year, while Syria was also affected by epidemic cholera during 1865–6. As a consequence of the epidemic in Egypt a conference was held at Constantinople in February 1866, and the quarantine stations of to-day were agreed upon. Among other safeguards, sanitary officers were sent to live at Jeddah and at Yambo, and an Egyptian doctor was ordered in

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* Hirsch. Geographical and Historical Pathology, vol. i., p. 413.

† Colucci Bey, 1866; Dr. V. Dumesthe, Alexandria, 1865; R. de Beauregard, Marseilles, 1878; Dr. de Bressy, Alexandria, 1865.

‡ The 1865 epidemic in Cairo was infinitely worse than that of 1883. The common street carts were piled with five or six half-naked bodies, dying and dead together, en route to hospital and grave-yard. The English employés of the railway suffered terribly, some 95 dying out of 102 attacked, while the survivors were half maddened by grief, drink and fear.

future to accompany the caravan of pilgrims to Mecca and Medina. The Egyptian Board of Health were quite unequal to the task of grappling with the threatened epidemic of 1865, for though they sent in April two native doctors to the Hedjaz to report upon the excessive mortality of this year's pilgrimage, and though these reported to them on May 10th terrible cholera at Mecca, they allowed more than 12,000 returning pilgrims to land at Suez,* and though cholera patients were seen at Suez on May 21st, and at Alexandria on June 2nd, the disease was not officially declared until June 12th. Here is well exemplified the futility of trusting to quarantine alone as protection from cholera, for upon this occasion Alexandria had been infected before the disease was declared at Suez, and cholera had passed on to France before it was officially known to be in Alexandria, while Valencia was infected from Marseilles before Marseilles confessed itself attacked. It appears that the sickness was most fatal and prevalent among the pilgrims the third day of the rites during the assemblage on Mount Arafat, on which day the deaths in Mecca were estimated at 200. The whole number of pilgrims this year was 90,000 to 100,000, and the accounts of the cholera mortality among them varies from 10,000 to 30,000. Deaths occurred among the soldiers, the inhabitants of the Holy Places, and the pilgrims. "The streets of Mecca, its mosques, the 12 miles of road "lying between the city and Mount Arafat, the Valley of Meena, and "the plain of Arafat, were encumbered with the dead."

1866. Dr. Néroutsos Bey, the Vice-President of the Sanitary Board, tells us that his office was summarily suppressed in consequence of his excess of zeal in discovering a reappearance of cholera in Egypt in 1866. There can be no doubt that the disease existed in that year, for in March and April there were sporadic cases,† and a fatal form of diarrhœa among the Suez Canal workmen, while in May and June dropping cases occurred in Suez and Alexandria, and again in August 23 deaths from "cholerine" were reported from a village near Zagazig of 300 inhabitants. Alexandria suffered for two months from September 12th from a considerable cholera outbreak, the cases numbering at one time 60 daily. No complete report of this little epidemic has ever been made.‡ The official number of pilgrims who returned from Mecca to Suez between May 7th and July 22nd was 12,887. Cholera was again observed in Mecca 20 days after the end of the religious sacrifices, and five days after the departure of the great caravan for Egypt, and was carried by the pilgrims to Medina, and thence to Yembo, Damascus, and other places.

In 1871, after a two years' remission for those countries that had suffered severely from the disease, cholera on June 19th again appeared in northern Arabia. It seems to have travelled from Persia, and quickly spread to Medina (1,000 deaths), Mecca, and Jeddah.

* The total number of pilgrims landed at Suez returning from Mecca was 18,490. Mr. Netten Radcliffe's Report to Privy Council on Cholera of 1865–74. London 1875.

† Procés Verbaux de l'Intendance Sanitaire d'Égypte. Paris, 1866, p. 114.

‡ Netten Radcliffe, p. 106.

News of this reappearance reached the Sanitary Board of Egypt on August 30th, by a report dated Medina July 25th, and formed the basis of much discussion on September 4th and during the following weeks.* The Turkish official figures for this year's pilgrimage reached 50,000, of whom some 16,000 either started from Egypt, or passed through Egyptian territory on their way to the Holy Places. But the Egyptian official document from which I am quoting believes that the total number of pilgrims at Mecca reached from 80,000 to 100,000 during the feast days which fell on February 19–23 in 1872. Needless to say, the slumbering pest which was only waiting for its victims to assemble, broke out once more at Mecca in February and spread without delay to Yembo, and Hodeida, but Jeddah and the sea route appear to have been quite free from the disease. The Grand Caravan of Cairo, numbering 1,130 souls, reported 24 deaths from cholera between Mecca and Medina, and after leaving Medina five deaths from ordinary sickness. More than 9,800 pilgrims were conveyed homewards through the Suez Canal, and some dismay was caused in the month of April by finding six dead bodies in the canal, presumably due to non-choleraic causes, but summarily disposed of by the captains of steamers who feared to be placed in quarantine at Port Said. The pilgrims returning to Egypt in 1872 numbered 2,043 by sea and 1821 by land, their dates of arrival extending from March 23rd to May 22nd.

When news reached Egypt of the 4,000 deaths which took place at Medina, and on the road between Mecca and Medina, a quarantine detention was ordered of 20 days at El Wedj, and another 10 days in case of necessity at Moses' Wells. The then Quarantine Board of Alexandria, consisting of 17 Europeans and one native member, not unnaturally took credit to themselves for preventing an introduction of cholera into Egypt by these measures.

Mecca, and the rest of Arabia, were believed to be clear of the disease in April, but in June it broke out near Suakim, and spread to Tokar, Kassala, Berber, and Dongola, accounting for 1,970 official deaths between June and November.

Dr. Demech† says that there was an outbreak of cholera in the Soudan in September 1872, travelling down the Nile from Dongola, and reaching Korosko in the first days of November, Egypt proper escaping invasion.

During the summers and autumns of 1871-72 cholera was expending its chief intensity in European Russia, where 633,318 victims were registered, and a quarter of a million people died. In 1873 the epidemic was very destructive in Austro-Hungary and Germany, and was directly followed in 1874 by the International Sanitary Conference at Vienna, which decided, among other things, against the supposed efficacy of land quarantine. Europe remained free of cholera from 1874 to 1883, but in 1875 an unexplained outbreak occurred in Syria, ranging widely over the interior and along the coast towns, and lasting

* Mésures prises en Egypte à raison du choléra. Alexandrie, 1872.

† Blue Book, No. 38 (1883), p. 57.

from March 22 at Hamah to the beginning of January, 1876. Dr. Mahé* calculates that Damascus lost 4,000 victims, the province of Aleppo more than 7,000, and the smaller towns in proportion.

The pilgrimage of 1877–78 proved again to be a great danger for Egypt, for cholera broke out at Mecca (2,500 deaths) on December 23, immediataly after the sacred rites (Dec. 13–16) which had been attended by more than 100,000 pilgrims.† It is thought to have been brought to Mecca by pilgrims from Penang, Singapore, and other places in the far East. The first batch of returning pilgrims reached the Egyptian quarantine station of El Tor on December 30th, and at once furnished five cases of certain cholera, and 16 cases of "suspicious diarrhœa."

During January and February 1878 the deaths at El Tor numbered 127, and were returned as cholera, 6; diarrhœa, 52; ordinary diseases, 69. Altogether 12,210 pilgrims arrived at Tor, of whom 5,184 were Egyptians, who underwent a further quarantine delay at Moses' Wells. No case of cholera occurred in Egypt. It was pointed out in the official report that many steamers carried a greater number of pilgrims than they were entitled to, one conveying 836 instead of a legitimate 626, and also that some 10,000 pilgrims embarked at Yambo to return home without any medical or sanitary supervision, and in conditions of great overcrowding.

In 1881 cholera was at Aden (151 deaths) in August and September, and on the south coast of Arabia in November. Its arrival at Mecca was officially known at Constantinople on September 27th, by a telegram from Jeddah dated September 21st, but the first cases were seen at Mecca at the end of August.‡ The disease rapidly spread to Medina and along the Damascus and Bagdad routes, but did not explode with violence at Mecca till the fête days, November 1–5, when there were 300 deaths per day (Dr. Chaffey Bey). This epidemic caused 6,000 to 7,000 deaths in the Hedjaz before it died out at the end of the year. The pilgrims returning to Egypt and the Mediterranean had several cases of cholera among them while being detained at El Wedj. (Dr. Ardouin's Report.) They eventually reached Egypt on and after January 22, 1882.

In 1882, about October 21st, at the commencement of the Bairam fête, cholera again broke out at Mecca, and it is noteworthy that Constantinople heard of it by telegram on November 2nd. Cases followed in the Minah Valley, at Medina and some neighbouring villages, at Jeddah, and along the caravan routes. Officially there were more than 600 cholera deaths altogether, and Dr. Mahé believes that this number

* Mémoire sur la marche du choléra, etc. depuis 1875–1884. Constantinople. Dec. 1884, p. 3.

† Exposé des mesures prises en Egypte contre l'epidémie cholérique du Hedjaz de 1877–8. Alexandria, 1878, p. 7. The Damascus caravan which left Mecca for Medina on December 19th was attacked *en route*, and lost 169 out of less than 5,000.

‡ Dr. Mahé, p. 15. Cholera in Egitto, Dr. de Castro; Milano, 1884, p. 54. Le Choléra, par Dr. Fournol; Paris, 1883, p. 112.

should be doubled. But the doctors at Mecca looked on it as a light epidemic, and said that about three-quarters of the attacked recovered. The Egyptian pilgrims underwent from 10 to 15 days' quarantine at El Wedj, and arrived in good health in December 1882.

Is it possible that any of them, returning then or later from the Holy places can have brought cholera germs with them in their bodies or their clothing? To suppose that they can have been in any way responsible for the explosion at Damietta in June 1883, we must argue that the poison laid dormant for two or three months, then caused epidemic diarrhœa, and finally when the drinking supply was at its worst possible, when the subsoil water was at its lowest, and when a large concourse of men had gathered at Damietta, was then recognised for the first time as cholera in a town which richly deserved its fate.

But this involves too many theories for me to wish to commit myself to. Only it has sometimes surprised me that some of those who so fiercely contended in 1883 for the theory of importation, should not have at least considered this question.

Possibly most of them were unaware that there had been cholera in the Hedjaz at the end of 1882, as even now it is certainly not generally known, but the idea would seem quite as plausible as that of direct importation from India.

A glance at Table I. will show that cholera in Egypt has nearly always been preceded by the disease at Mecca, though the evidence of direct transmission is not always present.

I may mention here that cholera again appeared at Mecca in 1883 on October 14th, the second day of the fête, and caused 637 official deaths at Medina and elsewhere during the ensuing three weeks. It is important to notice that the news of this modified epidemic did not reach Egypt or Turkey till October 30.

TABLE I.

Year.	Cholera at Mecca.	Earliest Return of Pilgrims to Suez.	Duration of Cholera in Egypt.
1831	Spring	July	July to October (end).
1834	?	? June	?
1837	Summer, and autumn 1835.	? May	September.
1840	?	? April	?
1848	1846-7-8	? February	June 24—October 20.
1849	1848	? January	?
1850	?	? January	June (end)—October 1.
1855	1854-5	October 19	May 26—September 22.
1865	April or May	May 19	June 2—September (end).
1866	May	May 7	March—November 12.
1883	1881-2	December 4, 1882	June 22—December 26.

1883. During the three-score years which have now elapsed since the first time when cholera attacked Egypt, it may be noticed that there has been a marked tendency to its less frequent appearance, for in the

years 1831–51 it was present in Egypt seven times, while in the second score of years it occurred three times, and in the last period, from 1871–91, it has only once been known. I have said that in 1865 cholera reached Europe directly from Egypt, and in 1883 she had the unenviable notoriety of passing it on a second time to the northern coast of the Mediterranean.

On June 22nd cholera was discovered at Damietta, and a sanitary cordon was put round the town, though many inhabitants had in the meantime fled to Mansourah, Port Said, and other places. The epidemic broke out at Port Said on June 25th, but there were only eight deaths there, and no sick among the small garrison of 100 English soldiers. On June 26th the first cholera death took place at Mansourah in the person of a sanitary attendant, who had accompanied an investigating commission to Damietta, and had assisted at an autopsy there. Four more deaths occurred the same day among refugees from Damietta, and on the afternoon of June 28th, a cordon was placed round the town. By this time there were 101 deaths a day, and the epidemic continued here altogether seven weeks, accounting for 1,927 deaths. The Mansourah cordon was soon made to include Talka, on the opposite bank of the Nile, and its history is one of unmitigated stupidity and irritation. Its sole justification, if any, should have been to confine the cholera and its prey to the infected town, but numerous instances were given of the escape of townspeople to neighbouring villages, and the cordon seems to have been regarded by the authorities as means for preventing doctors, chemists, drugs, and even food to enter the plague-stricken spot. Food rose to starvation prices, and a committee of Europeans had to be formed in Alexandria on July 10th to succour the beleagured inhabitants.*

At Mansourah, Dr. Dutrieux found in the hospital a few useful drugs, broken instruments, and a very apathetic staff. The dispenser objected to applying to Cairo for necessary drugs on July 21st, when there were 23 deaths per day, on the grounds that the epidemic was practically over.

Among the native doctors who specially distinguished themselves, however, by useful and zealous work was Dr. Mahmoud Bey Sidky, who did good service at Mausourah in July, and afterwards at Tantah.

In the meantime the cholera, in defiance of cordons, continued its march up the Damietta branch of the Nile, and invaded Samanoud on June 30th, and two days later Cherbine and Dakerness.

Alexandria was invaded by fugitives from Damietta and other towns, loudly clamouring for passages to Europe. So early as June 25th, a Greek from Mansourah died after a few hours' suspicious symptoms, and on July 2nd a recognised case of cholera was reported, followed by another on July 3rd, upon which a cordon was put round the infected houses, and the inhabitants were sent in quarantine outside the town for seven days.† Dropping cases continued till August 17th,

* Blue Books, Commercial, No. 22. (1884), p. 8.

† Rapport de la Commission d'Alexandrie pendant l'epidemie de 1883. Cairo, 1884. Le choléra en Egypte, Dr. Iconomopoulos. Cairo, 1884, p. 40.

when 50 deaths from cholera occurred, but in spite of the evident presence of the epidemic, an irritating cordon was maintained till August 13th. At this time I arrived in Egypt myself, and saw cases of disinfectants from uninfected Europe being gravely perfumed by officials in Alexandria before they could be received into the town.

During the first days of July an extraordinary commission of officials, consuls, and doctors set energetically to work to keep streets clean, houses whitewashed, refuse burnt, markets, slaughter-houses, and native quarters inspected, with special sub-committees for disinfection, public latrines, and drinking water.

Perhaps the most practical thing done at this time was to remove fœcal matter by boat to a distance of six miles from the port. This was found extremely expensive, and the work was stopped on August 19th, because it was thought that the epidemic in Alexandria was at an end. As a matter of faet, cholera deaths were registered until October 7th, when, after an intermission of 11 days, the disease re-appeared in a neglected insanitary suburb, and did not finally quit the town till December 26th. The registered cholera deaths numbered only 916, which compares very favourably with the 1865 epidemic, when 3,998 people died. But Dr. Iconomopoulos has pertinently pointed out that there was a great and unexplained tendency in the statistics for deaths from ordinary disease to increase in number during the epidemic, contrary to the usual custom. The daily average deaths of Alexandria vary from about 16 to 22, and these were the figures previous to the cholera explosion of 1883, but no sooner had the plague manifested itself than the ordinary deaths were raised to above 40, and even to 52 per day (August 13th). He calculated that the real number of deaths was abont 2,000, the missing cases having been hidden by the faulty diagnosis of midwives and barbers, who, among other entries at this time, certified to 92 deaths from asthma, 573 from convulsions, and 207 from aphthœ! The Alexandria sub-committee specially charged with the superintendence of the Ramleh quarter sent in its final report on September 14th, and in the distribution of some well-deserved praise, it specially commends the efforts of its member, who was made responsible for the native village of Chatby. In defiance of this cholera broke out in Chatby on October 18th, and quickly spread to Alexandria, causing a rapid and frightened exodus of Levantines to Cairo. However much praise one ought to give to the energetic townsfolk, who had apparently kept the foe at bay, it must be conceded that the special commissions were prematurely dissolved, and that the natives had been too early allowed to return to their ordinary unclean habits. It is significant that soon after the embargo had been removed from the sale and transport of hides and rags, cholera appeared among the workpeople of the tannery. The infected part of the village was evacuated the same day that the disease was reported, and this, perhaps, accounts for the recrudescence which at once took place in the different quarters of Alexandria. A commission was at once sent to Chatby to report, and the writer was one of those asked to inspect the village. A filthy almost stagnant canal

runs through the village, and in addition to conservancy purposes, drainage of tanneries, and cemeteries, it is occasionally used for drinking water. The outbreak was immediately preceded by rain upon two days, by easterly and southerly winds, by great stagnation of air, and by a rise of the maximum thermometer from 70° on October 10th to 84° five days later. The meteorological conditions had probably as much to do with the outbreak as the two theories started at the time, viz., effluvia from the tanneries, and release of cholera germs from insufficiently buried corpses by the medium of showers of rain.*

We must now return to July 1883, during which month the whole of the Delta became involved, and the disease slowly travelled up the Nile through Middle Egypt. The probability is that the primary cases were never reported, partly from the absence of intelligent local doctors, and partly from the not unnatural desire of the inhabitants to ward off cordons as long as possible. But, on July 6th, cases were reported in the Shubra district, a suburb of Cairo. On the next day the first cases were heard of from Faraskoor, the nearest town to Damietta. On July 10th cases were seen at Zifta, Talka, and Shibeen el Kom, and the following day Mit Gamr and Belbeis were known to be invaded. Shibeen el Kom is the chief town of Menoufieh province, and enjoyed the sad fate of suffering more than any other of the Egyptian towns. Numbering hardly more than 16,000 people, 1,563 deaths were officially registered, the daily mortality reaching 150 on July 23rd. Dr. Tsamis believed that there were actually 10,000 natives attacked by the disease, and he attributed both the quantity and the intensity of the poison to (1) the restraint of the cordon which kept 16,000 folk, and more than 7,000 head of cattle, dying of rinderpest in unusually foul air, (2) the accumulation in the middle of the town of 5,000 stinking hides from cattle which had died of the plague, (3) the total absence of all hygienic measures in spite of the reiterated proposals of a special international commission.† Dr. Dutrieux‡ also points out that on July 26th the town was in a state of lamentable filth, and that he saw natives, after the trying fast of Ramadan, drinking eagerly from very impure canal water. By this canal he saw natives washing a cholera corpse, while their friends a little lower down took their daily drinking supply. The cemetery of the town smelt so unpleasantly that, at a distance of 30 yards, even the natives held their noses. In the neighbouring village of Louat, more than 1,000 head of diseased cattle had been slaughtered, sold, and eaten. The provision provided by Government for fighting cholera up to July 26th consisted of four kilogrammes of carbolic acid and two barrels of chloride of lime, and this was intended for the whole province.

[Shibeen el Kom would seem to have been somewhat neglected by the central authorities, for when I visited it officially in February 1884, I found the so-called hospital was a barn, without floor, roof, or glass in

* Blue Books, Commercial, No. 22 (1884), p. 14.

† Dr. Iconomopoulos, page 38.

‡ Le Choléra dans le Basse Egypte en 1883, par Dr. Dutrieux Bey; Paris, 1884, p. 45.

the windows, without furniture, excepting drugs and a very old box of instruments. There were sometimes 14 patients in hospital, but at my visit there were only four, all prisoners, besides some large snakes which coiled about the rafters. Of the nine mosque latrines, I found that four emptied into the drinking canal, and that five were discharged into open ponds in the town.]

On July 14th, cholera was found opposite Cairo, in the little town of Ghizeh, and the next day it broke out in Cairo itself. During the next week it attacked, among other places, Mehallet el Kebeer, Kalioub, Simbellaween, Tantah, Ismailia, and Suez. In the last 10 days of July the remaining towns of Lower Egypt were invaded in the following order:—Benha, Rosetta, Zagazig, Atfeh, Tookh, Damanhour, and Dessouk. Without, however, expending too much of its force on unsurrendered towns of the Delta, cholera slowly invested the villages of Upper Egypt, reaching Minieh on July 25th, Benisooef and Assiout on 29th, the Fayoum and Girgeh on August 3rd, Keneh on August 12th, and Esneh on September 10th. At Assouan there were five cholera deaths about the middle of November, and here the southward march of the pestilence seems to have been arrested. South of Assouan it must be remembered there are no densely populated towns, while the great dry heat and expanse of desert are both inimical to cholera progress.

It can easily be understood that the British Government was by no means indifferent to the spread of this epidemic in Egypt, and Surgeon-General Hunter was specially sent from England to report upon it. He arrived in Cairo on July 26th, but was obliged by ill-health to leave Egypt on September 17th. The Egyptian Board of Health had stoutly maintained at first that they had sufficient doctors to cope with the epidemic, but this was afterwards found not to be the case, and for six weeks, dating from August 2nd, 12 English doctors did all that strangers could to introduce elementary sanitation into provincial towns. They were followed, at the end of August, by the arrival of eight English medical men from India, accompanied by 40 Mussulman hospital assistants. They made many suggestions for reform, for which they were thanked with unfailing courtesy. These 20 doctors were paid at a high rate (100*l.* a month besides all expenses), and the Egyptian Government bore their departure with great resignation. It may be mentioned here that Professor Koch and three assistants spent two months in Egypt, from September to November, and in examining the dejecta of 12 cholera patients, and the bodies of 14 others, the comma bacillus was first found in Egypt and afterwards re-discovered in India and at Toulon. About the same time there were two other scientific missions in Egypt, one sent by the Russian Government under Dr. Eck, and the other under Dr. Strauss, sent from Paris in August, a most promising member of which fell a victim to the epidemic.

Cholera in Cairo.—Epidemic cholera having been officially declared on June 24th to exist in Egypt, a special sanitary commission of European and native notables, under the presidency of the prefect of

police, was appointed for the protection of Cairo on July 5th, but the actual work of the local committees was not begun till July 12th. This was none too soon, for on July 14th the disease broke out at Ghizeh, whither it had been conveyed by boats laden with timber from Lake Menzaleh. The town was at once invested by a cordon, but this was removed soon after cases had occurred at Boulak on the night of July 14th. Still, on July 20th a harmless party of six English were prevented from driving to the Pyramids. Boulak, the old part of Cairo, is the most densely-populated district of the city, and therefore the most insanitary. In addition to the habitual absence of all cleanliness, there were in Boulak depôts of raw fresh hides, of rags waiting to be sorted, of putrefied fish (fisikh), and a dense mass of mud huts with an intervening space of seldom more than six feet. These huts are unventilated, with roofs covered with animal excrement for future fuel, and with floors of alluvial soil soaked with organic matter resulting from generations of human beings and of their cattle and poultry.

Boulak, it was calculated, had a population of 53,000 at the onset of the epidemic, and lost 2,859 by cholera, the maximum having been reached on July 23rd, when 273 deaths were registered. The sanitary inspector of Cairo calculated that there were about 1,000 cholera deaths in Boulak alone (included in above figure, 2,859) which were not officially recorded.* One third, and perhaps more, of the total mortality in Cairo could be traced to the Boulak quarter, where cases continued to occur till August 21st. Next to Boulak, Old Cairo was the quarter which was most severely smitten. Cholera appeared there on July 17th, and lasted till August 14th, causing 964 deaths among a population of 20,000, 93 deaths having occurred on July 30th. Old Cairo is now a huge cemetery, and it was believed that the insanitary burial customs of both Mussulmans and Copts had something to do with the severity of the disease. The Abdeen quarter, with a population of some 36,000, lost 535 people between July 20th and August 21st, the maximum of 52 having been reached on July 27.

Needless to say every one of the 12 districts of Cairo was in its turn attacked. The one which suffered least was the Gamaliyeh, where only 79 deaths occurred between July 22nd and August 9th, the maximum mortality (10) being reached on July 30th, from a population of about 29,000.

The total mortality in Cairo was reckoned at 6,650 on a population of about 350,000, the maximum being (more than) 558 on July 24th. The daily deaths always surpassed 300 from July 21st to August 3rd. The European residents of Cairo who, under ordinary circumstances, number 22,000, were many of them absent during the summer months to escape both the heat and the cholera. Excluding the army of occupation only 126 deaths were reported among them, viz.: 40 Greeks, 30 Italians, 19 French, 14 English, 13 Austrians, etc.

* Rapport sur l'épidèmie du Caire en 1883 par Dr. Ahmed Handy Bey. Le Caire, 1884, page 23.

Three reports of Commission Spéciale Sanitaire. Le Caire, 1883.

Cairo was pest-ridden from July 14th to August 24th, and during those six weeks many were irresistibly reminded of Kinglake's account in "Eothen" of one of the last outbreaks of plague at Cairo, when there were reported to be from 500 to 1,200 deaths a day.

There was the same panic and flight among all classes deeply imbued, fear of individual contagion, desolation in the streets, and an atmosphere of great moral depression, only to be temporarily cheered by the encouraging presence of fires in the streets, and rendered more acute by the constant passage of funerals and noisy mourners.

The Royal family showed an excellent example to the upper and middle classes. H.H. the Khedive won golden opinions by visiting some of the infected centres for himself, and lost no opportunity of thoroughly inspecting cholera hospitals.*

Prince Ibrahim placed a large factory at Boulak at the disposal of the committee, and a temporary hospital with 100 beds was opened there on July 24th. Prince Hassan gave many cases of medicines, and even offered the loan of his palace.

Upon July 23rd, at the height of the Cairo epidemic, an "Extraordinary Superior Commission" was appointed, consisting of the native ministers and three British generals. Their first act was to authorise the evacuation of some of the overcrowded mud hovels of the poorest classes, and the destruction by fire of those pronounced unfit for future habitation. The number of inhabitants thus dislodged was about 6,000, two-thirds of whom were provided by the Government with ample accommodation and food at the Barrage, about 18 miles north of Cairo, the remaining third, owing to the want of supervision, were allowed to disperse to the villages.† This Barrage emigrant camp was a great success, and though the occupants came from the most infected districts only 74 deaths took place among them. Some 20 deaths occurred in another camp at Tourah, where 600 natives had been previously sent.

It should be noted that the burnt huts were not the property of the evicted inhabitants, and it is only to be regretted that the Government did not follow up this salutary measure by preventing similar huts from being erected after the epidemic was over. At the end of August the emigrants were allowed to return to a temporary camp at the west end of the Nile bridge, and were then gradually drafted into the town.

Besides all the obvious schemes for surface sanitation and for preventing the filthy habits of the population the special commissions organised an ambulance service for the transport of sick to the hospitals consisting of 17 carriages and 85 bearers with stretchers. The constant funerals passing through the city were objectionable from two points of view. The noisy chants of the mourners added to the alarm of the citizens when heard some scores of times a day, and the processions

* In former epidemics the ruler of Egypt had usually fled the country.

† Blue books. Commercial, No. 39 (1883). p 50.

were therefore ordered to wend their way through the less frequented streets. According to the Mussulman custom, their dead are not buried in coffins, but carried to the cemetery in open wooden biers merely covered by a shawl, and it used to be a daily occurrence to see the mourners returning from the funeral *sitting inside the bier*, which was carried back on a trolly drawn by a donkey. The same biers and same shawls were used over and over again. A number of closed biers lined with zinc were provided gratis, and policemen were told off at the cemeteries to see that all grave clothes were either buried or burnt. The funeral customs of the natives do not cease to be objectionable upon the arrival of the dead man at the cemetery. The corpse is placed not in a grave dug out of the ground but in a tomb above the ground with an arched roof. The tomb is insecurely sealed by a plastering of mud; the roof often cracks, and a free escape of noxious gas occurs so long as the body is putrefying. This accounts for the evil smell which is present in most Egyptian burial places.

During the height of the epidemic in Cairo some 300 wood fires were daily burnt in the streets, and certainly produced an excellent moral effect on the population. Some 400*l.* was expended by the committee upon tar and sulphur for these fires.

Cholera among British Troops in 1883.

As early as June 25th, sites for cholera camps were chosen by the authorities, and other arrangements were made in view of an outbreak among the Army of Occupation. The disease, as I have shown, broke out in Cairo on July 14th, and on the 20th, when the cholera deaths had reached 174, and an English girl had died in the Boulak quarter, it was decided to send two regiments to Suez. On the evening of July 21st the first case in the English army occurred and proved fatal in a soldier of the "Black Watch" at Suez.*

On July 24th, in consequence of cholera having attacked English soldiers in both their hospitals, and in Kasr-el-Nil, and the citadel barracks, all patients who could be moved were taken to a desert camp at Helouan, 12 miles from Cairo, and here cholera cases occurred daily among them from July 26th to August 8th. The Royal Sussex Regiment was sent from Cairo to Ismailia, on the Suez Canal, on the night of July 24th, but cholera showed itself among them there on the afternoon of July 26th. The mounted troops were moved by train to El Warden, 30 miles N.W. of Cairo on July 25th, but on July 27th, 10 cholera cases and six deaths occurred, quickly followed by others. By July 27th, cholera was established everywhere among the troops, and further moves were carried out with the least possible delay, but no cases happened after August 23rd.

* Army Medical Reports by Surg.-Gen. Irvine and the Director-General. Vol. XXIV. p. 281, and Vol. XXV., p. 116. London, 1884–5.

Fifteen cases only occurred among the troops at Alexandria, and all those were in the Ramleh Hospital, of which 12 were fatal between August 3rd and August 23rd. The shortest fatal case terminated in two hours, the longest in 76 hours.

The strength of the Army of Occupation was 6,650, 194 were attacked by cholera, and 142 of them died. It will be seen that the number of attacked was small, but the number of fatal cases very great, showing extreme virulence in the type of the epidemic, for 19 cases died in less than six hours, 45 others in less than 12 hours, and 40 more died under 24 hours.

Surgeon-General Irvine writes, "there is no doubt that the troops "moving into camp carried the disease with them, and it manifested "itself after their arrival," and indeed it seems evident that if troops are to exchange comfortable, cool quarters for unwonted fatigue and exposure to shadeless desert during the hottest time of the year, they should complete all their primary moves before cholera has actually broken out among them.* Barrack accommodation, per man, during the summer was 1,150 cubic feet, and 60 feet superficial. In his most interesting Report he points out that the Hospital Corps suffered out of all proportion to other branches of the army. One hundred and two non-commissioned officers and men were employed in various hospitals, and of these some 45 were engaged in nursing cholera patients, 16 were attacked by the disease, and 13 died. Further, 80 orderlies were employed as supplementary nurses, and of that number 17 were attacked and eight died. Surgeon C. B. Lewis fell a victim to zealous work, while several other doctors suffered from choleraic diarrhœa, and here it may be noted that though it was agreed on all sides that the Army Medical Department behaved throughout in the most exemplary way, no sort of official recognition was ever made of the usefulness of their labours. If combatants deserve promotion and decorations at the close of a campaign, it seems illogical not to distribute suitable rewards to those who risk their lives and health in striving to protect an army from a plague which is in their midst.

Cholera in the Egyptian Army.

On July 19th, two houses at Abbassiyeh were prepared for occupation by any cholera cases which might arise among the native troops, whose average strength at that time was 3,645. On July 22nd the first case was seen, quickly followed by seven others; in all 86 men were attacked before August 25th, and 36 of them, including one officer, died.† The Egyptian doctors were not favourable specimens of their

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* The Alexandria troops remained stationary in their barracks and totally escaped cholera, but it must be remembered that that town has the advantage of a cooler climate, and was less subject to the 1883 epidemic than Cairo.

† Blue Books, Commercial, No. 39 (1883), p.p. 8–11. Dr. Acland, St. Thomas' Hospital Reports, Vol. XIII., p. 269.

class, two of them demoralized the orderlies by their personal fear of the disease, and the early patients were placed within a circle of chloride of lime, into which the medical man was loth to enter. Various squirts and perfumes were also freely used by the medical authorities. The sick were then entrusted to the late principal medical officer of the native army, who has since turned chaos into a valuable department. In his efforts for cholera patients he was nobly seconded by the English officers, who nursed the Egyptian soldiers by night and day with their own hands.

Many of them suffered at the time from the diarrhœa which so often accompanies a cholera epidemic, and the Commandant of the hospital almost lost his life from enteric fever contracted at that time.

Statistics of 1883.

The extraordinary expenditure incurred by the Egyptian Government on account of the epidemic amounted to more than 65,000*l.*, but to this must be added an unknown amount for interference with the country's commerce and revenues. The death returns are considerably below the real figure, for the published official bulletins give 582 as the cholera deaths during the last nine days of June, 12,689 at the end of July, nearly all from Lower Egypt, 27,294 on the last day of August, and only 28,083 on September 30th, when the epidemic was practically at an end, and a grand total hardly exceeding 28,300. The daily mortality was very high for a month after July 20th, and reached its maximum in the first week of August.

During the epidemic the Board of Health was too demoralized to control the statistics, many of the registration clerks had been withdrawn from their posts, and many errors of at least 100 per cent. were discovered in the death returns. When the epidemic was all over, a friend whose name I am not at liberty to mention, spent some months in searching and tabulating the returns of all Egypt. He found that the cholera mortality actually reached 58,511 between June 22nd and December 26th, the death-rate among males being very slightly higher than among females. In 1865, the cholera (official) death total was 61,192, and taking the only available comparative statistics (eleven), it is found that the average duration of 1865 was 61 days, compared to 48 days in 1883.

A glance at Table II. shows how Damietta was punished for her sins. The comparative immunity of Alexandria (916 deaths compared to 4,142 in 1865) was thought to be partly due to the open spaces in the town resulting from the previous year's fires and destruction of houses, but it must be remembered, too, that it is fortunate in possessing a very carefully superintended water-supply.

TABLE II.

——	Population.	Cholera Deaths.	Mortality per 1,000.	Duration of Epidemic in Days.	Remarks.
Alexandria - -	225,396	916	4·06	178	(Recrudescence.)
Cairo - -	371,576	6,650	17·89	40	3,262 left through panic.
Rosetta - -	19,378	233	12·02	25	
Damietta - -	43,616	1,927	44·18	53	
Port Said - -	16,560	8	·48	10	
El Arish - -	3,923	—	—	—	
Ismailieh - -	3,364	40	11·89	22	
Suez - -	11,115	20	1·79	28	
Provinces.					
Behera - -	398,856	939	2·35	59	
Garbiyeh - -	929,488	15,501	16·67	63	
Menoufiyeh -	646,013	9,372	14·51	67	
Dakhalieh - -	586,033	6,337	10·81	67	
Sharkieh - -	464,655	2,945	6·33	58	
Kalioubiyeh -	271,391	1,837	6·77	56	
Ghizeh - -	283,083	3,996	14·11	61	
Benisouef - -	219,573	996	4·53	44	
Fayoum - -	228,709	786	3·43	28	
Minieh - -	314,818	1,769	5·62	40	
Assiout - -	562,137	1,544	2·75	79	(Recrudescence.)
Ghirgheh - -	521,413	1,994	3·82	35	
Keneh - -	406,858	526	1·29	64	
Esneh - -	237,961	175	·73	37	
	6,765,976	58,511	8·65		

Causes of 1883 *Epidemic.*

The cause of this outbreak is and always will be involved in some mystery. The two theories started at the time, and debated with some heat, were (1) that it was directly introduced from Bombay, and (2) that cholera had been endemic in Egypt since 1865.

Now Bombay had been for some months rather more free than usual from cholera, and it became necessary to try and prove that one or more individuals had imported the disease direct from Bombay to Damietta. The first suspected was a fireman. It is a little doubtful whether cholera did not precede his arrival at Damietta, but even supposing that he reached it before the explosion, it was quite certain that he did not come from an infected ship, that his own disease was alcoholism and not cholera, and that the Damietta men whom he was supposed to have infected only became cholera stricken eight or nine days afterwards, when the daily deaths of the town had already reached 101. The second case brought forward was as deficient in proof as the first, and was temperately and ably handled by Dr. Simpson, who spent four days at Damietta for this special purpose.* A woman named Zendaia was accused of having brought the disease from Port Said to

* Blue Book, Commercial No. 22, 1884, p. 30.

Damietta, but on investigation it was proved that she became infected at Damietta, and was one of those who conveyed it to Port Said, where she was taken ill on June 27th or 28th. Cholera has never been traced in Egypt as having been directly brought by ship from India, though there are now steamers which make the voyage in 10 or 11 days.*

The endemic theory cannot be dismissed in so few words. Sir Guyer Hunter reached Egypt on July 26th, and on August 19th, after an inspection of Cairo, and three days spent among the provincial towns, he entertained "grave suspicions of cholera having been endemic "in Egypt since the epidemic of 1865."† His further researches tended to confirm his suspicions; and before discussing the theory, it may be noted that of all the scientists and doctors then busily studying the question, only three or four, all unacquainted with Egypt, agreed with him. His chief disciple, Dr. Dutrieux, had some reputation as an African traveller, a writer, and an oculist, but none as a medical observer. He published the theory that bovine typhus had been able to produce enteric fever, bilious typhus, walking typhus, and spotted typhus, and that cholera was the next link in the metamorphosis. The lay newspapers twitted him at the time by asking whether one variety of fruit stone planted in an orchard would produce apples, pears, plums, and oranges!

Sir Guyer Hunter gives two reasons for his belief that cholera in Egypt was endemic, the great annual prevalence of diarrhœa, and the recurrence from time to time of cases loosely called cholerine, cholera nostras, etc.

Together with all other observers he points out that the diarrhœa which immediately preceded June 1883, may have been due to contamination of water by carcases, or to the large amount of diseased meat which was eaten by the poorer natives, consequent on cattle plague. But in most years there has been no murrain among the herds, and therefore some other cause must be found. If statistics are studied it is found that the chief diarrhœa death-rate of Egypt is in children under five years of age and in the summer months.

The monthly mortality after the age of five years does not vary much during the year, it is always high.

And we may go a step farther, for even in children between the ages of one and five there is no very great difference between the summer and winter months. But directly we come to the case of native children under one year we see a startling difference. To take Cairo alone, infants under one year die during the cool months at the rate of less than 400 a month. During April and May their death-rate gradually mounts up till in June, July, August, and September, it is very high indeed, even reaching 800 a month in August. In October it has fallen again to less than 400 a month. The death-rate is chiefly from diarrhœa and occurs not only at the hottest time of year, when

* *See* paper read by Dr. Koch at Berlin Conference, in July 1884. Erforschung der Cholera. Berlin, 1887.

† Blue Book, Commercial No. 38, 1883, p. 1.

infants drink water in addition to their mother's milk, but it must be noted that the highest mortality corresponds with the season of lowest subsoil water, and the beginning of its rise. The Egyptian does everything he can to pollute his water supply, and makes no rational attempt to dispose of his sewage. The consequence is that diarrhœa, dysentery, enteritis, and whole families of entozoa are endemic in Egypt, but this is not a proof that cholera is endemic. As an extraordinary fact, perhaps, due to some racial immunity, enteric fever is very rare among the native population, though common enough among Europeans.

It may easily be conceded that the so-called cholerine and cholera nostras have no clinical dissimilarity to cholera, and that all cases covered by such unsatisfactory terms would be considered true cholera during an epidemic. As against this it must be remembered that during an epidemic many cases of simple diarrhœa are covered by the name of cholera.

It may be that bacteriology will discover to us the difference between true cholera and the apparently sporadic cases which occur dissociated from all endemic and epidemic trace of the disease. The practical difference between true cholera and the doubtful cases is that the latter *can* be produced by poisonous food and fruit, are nearly always isolated, are by no means very fatal, and have no tendency to spread, apparently lacking the special *exotic* germ (whatever it may be) which is one of the necessary elements of the outbreak of epidemic cholera.

Sir G. Hunter cross-examined several doctors as to the existence of any kind of cholera in Egypt. Nine of them searched their memories and their note-books, and told him of 16 cases of "cholerine" which had occurred in the practices of themselves and their friends between the years 1867–82. There were two other cases transported from Italy, and many recollections of the years 1865–6, when cholera was present in Egypt.

It is significant that of these 16 cases no less than 13 recovered, while an Italian and a Greek lady died, and also a man after eating pickles. It is upon these 16 cases during 16 years that the endemic theory is founded. Similar cases occur every year in Europe, as Sir G. Hunter himself confesses (p. 41), and at least two or three cases caused some excitement in London at the end of August 1890.

There is, of course, a tendency in all countries to suppress or modify the diagnosis "cholera" in death returns, if it is believed any unreasoning panic might result from its mention, but in Egypt there were considerably more than 100 European doctors, unconnected in any way with the Government, and it can hardly be supposed that they had entered into a league to suppress the existence of cholera, if it really existed in the country. Moreover, as many of them had served through previous epidemics it cannot be maintained that they were not conversant with the disease.

So far as I know there was nothing in 1883 to justify the opinion that cholera was endemic, and though I have paid some attention to the subject for eight years, I know of no arguments which have occurred in its favour since. The epidemics of 1848 and 1865 were each followed by a postscript outbreak in the succeeding year, and I fully believed that in 1884 we should have another manifestation in Egypt. In February 1884 I was appointed to the head of the reorganised Sanitary Department of Egypt, and carefully looked out for all cases and all rumours of suspicious sickness.

I was rewarded by hearing of the following cases which I published at the time.* At the end of April 1884, three suspicious cases, not fatal, occurred among English soldiers in Cairo. During May four other cases were seen by four European doctors, none fatal.

In June an outbreak of diarrhœa and vomiting was reported to me from Damietta, this was due to salted drinking-water, and it is certain that no one died there from cholera.

In July one case, not fatal, certified as "cholera nostras" occurred at Alexandria, and was seen by many doctors. The only other case which could be heard of that summer was on board a French steamer, which had just come from Marseilles, then cholera-ridden.

There may have been two or three similar cases every summer, but I know of no others till the summer of 1886, when two cases occurred in Alexandria, a Dane who recovered, and in whose motions the comma bacillus could not be found, and another who was poisoned by sausages, but not fatally.

In 1887 I saw a fatal case after eating melon, which has not been reported.†

The only other case that I know of was an English soldier in the spring of 1889, who had very suspicious symptoms, but recovered.

Condition of Damietta.

In spite of belief in the necessity of an *exotic* germ for the production of a cholera epidemic, there can be no doubt that Damietta in 1883 possessed all the known requisites for engendering filth disease. In addition to the predisposing causes common to the rest of Egypt, a flat alluvial soil, soaked with decomposing organic poisons, drinking water soiled by every imaginable means, heated stagnant air, an apathetic population, and a poverty-stricken indifferent Government, Damietta

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* St. Thomas's Hospital Reports. Vol. XIII., p. 351.

† He was an English prison warder, æt 37, and died on June 15, the third day of the disease, which was called "choleraic diarrhœa." He had shrunken skin, typical face, empty bladder, but resonant abdomen and liquid brown offensive motions. T. in rectum 105°, R. 36, P. 114, just before death. At the autopsy, 16 hours later, rigor mortis, hands and feet shrunken, congestion of left lung base and of abdominal organs. His right heart contained liquid black clot, the left was contracted, pale and containing no clot, but a little liquid dark red blood. The intestines were slightly inflamed throughout, no ulcers, but Peyer's patches and solitary glands standing out too well. Stomach was congested and bile-stained, with brown contents, chiefly milk and brandy.

had, unfortunately, at least five other dangers, which affected chiefly the natives of the most crowded and insanitary part of the town. The richer inhabitants drew their water supply from cisterns filled from the Nile at its height, but the poorer folk living in the quarter of the town where cholera was first seen and was most rife, were entirely dependent for drinking water upon a low Nile, for several weeks below sea level, and therefore extremely brackish, or upon an open canal-drain which ran through the town and received the sewage of houses on its banks, and also of the public latrines attached to many of the 60 mosques in the town.

These conditions prevailed every May and June, but in 1883 must be added the wholesale contamination of the Nile by carcases of attle which had died of bovine typhus. One Englishman says that he removed during two months more than 2,000 carcases in every stage of putrefaction, the greater number being from the Damietta branch of the Nile.*

The air of the town was in a very poisonous state, and was not remedied by the depôts of stinking salted fish (fisikh) arriving from the neighbouring lake of Menzaleh for the consumption of Damietta and the rest of Egypt. The last of the exciting causes special to Damietta was the fair, which immediately preceded the cholera explosion (June 13–20). Some 15,000 people had been allowed, without any sanitary supervision, to encamp on the outskirts of the town and to overcrowd the existing 30,000 inhabitants.† The wonder is not that cholera appeared, but that any remained alive to debate its origin.

In June 1891, I visited Damietta in order to see how far sanitary improvements had taken effect. The existing cisterns are cleaned out and refilled every year, and a large new one built by the Government supplies the town for two months and a half. Moreover, a new circular fresh-water canal has been excavated, bringing Nile water from near Cairo, and the central canal-drain of the town has been filled in and converted into a road. The river and the canals no longer contain dead bodies, and the local fair has been shorn to harmless dimensions. The sale of decomposed fish still goes on, and brings in a considerable revenue to the Government.

Diarrhœa preceding Cholera.

Dr. Simpson points out‡ that in the first five months of 1883 there was a great increase (398 to 590) in the death-rate of Damietta compared to the previous year, and that, whereas in 1882 the diarrhœa entries reached only 104 for those months, the figure rose to 198 in 1883. Again, at Assiout, cholera was not reported till July 29, 1883, but Dr. Haddad found the death-rate for the first seven months of that year was 693 compared to 513, the average of the two previous years. Also that more than one-third of the total deaths were returned as

* Warm Corners in Egypt. London, 1886. Page 200.

† Le Choléra de Damiette, par Dr. Chaffey Bey, Alexandria, 1883. L'épidémie cholérique de 1883, par Dr. Dacorogna Bey, 1884.

‡ Blue Book No. 22 (1884). Page 31.

diarrhœa. In Alexandria the deaths from bowel complaints in the first five months of 1883 were 860, while in 1884 there were only 313. A similar high rate during the early months of 1883 could probably be discovered in most Egyptian towns, but in Cairo I find that there were only 2,266 diarrhœa deaths compared to 2,027 in 1884.

Egypt is, as regards sanitation, a great deal more than 35 years behind England, but it is interesting to compare for a moment the 1883 cholera in Egypt with that of the British Isles in 1848. Both these visitations were preceded by an unusual amount of typhus fever, and both occurred in populations so accustomed to diarrhœa that they thought nothing of it even in an epidemic form, and seldom sought intelligent advice for it. Indeed, over the whole of Europe and in every town and village in England, wherever cholera broke out, it was preceded by an enormous amount of diarrhœa.* From Russia, Berlin, Hamburg, and other cities came the same story of great looseness of the bowels among all classes of people. In the British Isles, a system of house-to-house visitation to try and cope with premonitory diarrhœa in its first stage led to some interesting results worth quoting.

In Glasgow 13,000 cases of premonitory diarrhœa were visited, of which less than 1,000 had advanced to the stage of rice-water purging. In London, medical visitation was begun at a time when the weekly cholera deaths had reached 2,026. Some 43,737 patients with premonitory diarrhœa were visited, and 52 "passed into cholera after "treatment"; 1,758 cholera cases were also seen. Dr. Sutherland wrote very strongly at this time, "that the whole force of the medical "preventive measures should be directed against the earlier stages of "the disease."

As at Damietta in 1883, it was pointed out that the cholera of 1884 at Marseilles and Toulon was preceded for several months by an excess of diarrhœal disease.†

This epidemic diarrhœa must surely have been caused by impure drinking water.

After 1883 Egypt enjoyed a respite from cholera and the fears of that scourge till 1890, when she found herself seriously menanced by two near neighbours, the southern Hedjaz and northern Syria.

Cholera at Mecca in 1890.

On July 28th, the second day of the fête, cholera once more broke out in the village of Mina, and it is satisfactory to know that the news reached Alexandria and Constantinople the following day. The earliest victims‡ were from among the soldiers of Jeddah garrison, and Turkish sailors who were encamped near caravans which had already had a high death-rate. It is believed that the poison was carried by caravans from the Persian Gulf, which is only 17 days from Mecca. Since August

* Reports of Boards of Health on Cholera of 1848–49. London, 1850. Page 104, &c.

† Le Choléra et les Quarantines. Dr. Dutrieux. Bruxelles, 1884. Page 49.

‡ Reports of Dr. Ardouin Bey and Dr. Ebeid, Alexandria, 1891.

1889 the enemy had been lurking about Mesopotamia, and in May 1890 had attacked Mosul, Van, and Diarbekir. From Mina it lost no time in spreading to Mecca, Jeddah, Medina, Yambo (August 31) to Massowah in September. Excessive heat and southerly simoon winds prevailed during the summer months, while heavy rain unfortunately fell on the day of Arafat, July 26.

One hour after the first case was heard of, there were three others; after another hour 13 deaths, and the following day, when everyone was hurrying back to Mecca, many dead were lying by the roadside.

At Mina there was a complete absence of drugs, disinfectants, hospitals, &c., and from a private account I learn that doctors were urgently wanted at Jeddah, for the greatest unpreparedness was everywhere present. The pilgrims embarking at Jeddah for the pilgrimage were 39,429, and at Yambo 4,067, and there are said to have been 20,000 from the Persian Gulf. In the absence of reliable statistics we must suppose that the numbers were as usual, between 80,000 and 100,000. The official death-rate from cholera at Jeddah was 135 out of 12,000 pilgrims who had hurried there on August 4th, then it fell to 76 and 79 on August 10th and 11th, on which days it was still 108 and 117 at Mecca.

"The death-rate was put down as 400-500 per day, but it is firmly believed in Jeddah that the total mortality in the Hedjaz during about three weeks was 25,000 to 30,000, numbers of whom died from starvation."*

An enormous number of pauper pilgrims furnished ready fuel for the epidemic, for they lay about the streets eating and drinking any filth that came to hand.

The Egyptian Government might perhaps rather more energetically prevent their share of paupers from leaving on the pilgrimage, and as many of the Hajjis elect to spend the month of Ramadan in the Holy Places, it might be well to send the medical officer detailed by the Alexandria Quarantine Board some three months earlier than is the custom. In 1890 their doctor reached Mecca on July 24th, only four days before the epidemic was reported. If one might dare to give advice to the Board, it would be to send an older and more experienced man to the Hedjaz, who would perhaps be able to induce the Turkish authorities to consider sanitary questions. Turkey is quite certain not to introduce any satisfactory reforms unless pressure is put upon her by Europe.

At Jeddah (22,000 inhabitants) she provides six doctors, one of whom draws as much as 720*l.* a year. At Mecca there is an inspector at 600*l.*, besides 10 other doctors and a budget of 4,000*l.* for sanitary measures.

Mecca (110,000 inhabitants) is of course extremely crowded during the holy season, so that 3*l.* or 4*l.* are paid for one night's lodging, and 30 people crowd into a small room to divide the expense.

* Report of the Haj of 1890.

The houses are provided with cesspools which are seldom or never emptied, and the latrines are too odorous for use. The drinking supply comes from the Ain Zebaida, and runs into an open reservoir of about 100 yards diameter. I am assured that the water smells, that the reservoir is never cleaned out, and that it is unprotected, so that people can throw in whatever they wish. All accounts agree that this water is contaminated by neighbouring cesspools, like the holy Zem Zem water. Mecca itself stands in a winding valley, shut in by rocky hills which reverberate the fierce summer heat.

Most pilgrims, imitating Muhammad's own practice, make their exhaustive running ceremony seven times between the hills before the sacred rites, and on the same day a jostling fanatical throng penetrates the stagnant air of the Kaaba. Then on the first day everyone goes through Mina (3 miles) to Mount Arafat, 12 miles from Mecca. The mountain is well supplied with spring water from the rock, and is about 200 feet high, with a base of one mile circumference. On the second day there are prayers at daybreak, and religious preparation for "The Sermon of the Standing" on Arafat, which lasts for the three hours that precede sunset. The newly-formed *hagag*, almost naked exhausted with fatigue, fasting, and emotion, then hurry towards Mina in reckless and chaotic confusion, which lasts most of the night.

The third day is ushered in by prayers at dawn, and then, while some continue an orthodox but headlong flight to Mecca, others crowd dangerously in a seething mass in a narrow pass to stone the Devil's pillars. Then comes the sacrifice, mostly of sheep with a few oxen and camels, and the land begins to smell worse than any slaughter-house. Burton thought that less than 6,000 sheep were sacrificed, other writers, perhaps less accurate, have put the number very much higher. Mina village, where this takes place, is shut in by hills all round, and as no conservancy arrangements are provided for the pilgrims, and no heed is given to the remains of the slaughtered animals, it is not wonderful that the air becomes absolutely pestilential, quite preventing sleep at night. Some try to protect themselves by stuffing their noses with cotton wool, but all suffer from the heat, stench, blood-soaked earth, flies, kites, and vultures.

The water at Mina comes from the Ain Zebaida, in Mecca, and is kept in big cisterns which are said never to be cleaned out, and therefore contain many entozoa.*

Many pilgrims fly at once to Mecca to escape these horrors immediately after the sacrifices, but there are others detained there by religious scruples or by other reasons during all the three days of drying flesh.

This condition of things is quite enough to produce any pest besides cholera, and there is said to be always a great diarrhœa mortality among the pilgrims. On the day of Arafat alone there were, in 1888, 2[illegible] official deaths; in 1889, 17 deaths; and in 1890, 13 deaths.

* This account is taken partly from Burton's personal narrative of 1853, and partly from the accounts of Egyptian friends who made the pilgrimage in 1890.

Immediately after the Holy Week religion enjoins on the faithful an immediate dispersion from Mecca, which makes it easy for any existing disease to be diffused at the same time. Many proceed to Medina, but even on the desert route they are exposed to additional danger from the Bedouins. In 1886 about 70 pilgrims were killed or seriously injured on the first day of this journey, mostly by camel drivers.

The Quarantine Board, though not quite prepared for the reception and treatment of the returning pilgrims, took energetic measures during August and September to deal with the question, and it is perhaps due to their exertions that cholera did not reach Egypt. At El Tor all were subjected to 20 days' observation after the last case of cholera in the camp, and Egyptian pilgrims were subjected again to three days' quarantine and disinfection at a station 50 miles from Suez, Ras-Mallap. Some of the longest cases were kept in camps for as much as 51 days. Some 10,121 were landed at El Tor, of whom 422 died between August 11th and November 20th. The deaths included 135 from cholera, nearly all being Turks and Syrians, 123 from "marasme," and 41 from dysentery. One soldier forming part of the sanitary cordon also died from cholera. The 5,106 Egyptian pilgrims only had 31 deaths among them, viz., one from cholera, nine from "marasme," 13 from dysentery, and eight from other diseases About 200 of the Egyptians died from cholera in the Hedjaz.

The Egyptian Government formed a special commission in Cairo, which had its first sitting on August 6th, and issued some very useful instruction. The Tantah fair was postponed, the small streets of Cairo were kept clean, and the provincial towns were made cleaner than they had ever been seen before. Unfortunately this was but a spirt, and no real improvements in public health have been recorded during the following nine months.

Cholera at Mecca in 1891.

The scourge again broke out at Mecca on July 11th, and on July 17th, the day after the sacrificial fête, 23 deaths from cholera were reported at Mina. The pilgrims hurried back to Mecca, where there were more than 400 daily cholera deaths on July 20th and 21st, the deaths gradually declining as the pilgrims left the city. On July 19th, 556 deaths were reported from Medina, and the following day cases first occurred at Jeddah, where, on July 27th, there were 30 official deaths. Early in August the disease was reported from the pilgrims at the quarantine station of El Tor. But there was no cholera in Egypt.

Danger of Pilgrimage to Egypt.

It is quite certain that returning pilgrims brought cholera to Egypt in 1831 and 1865, and it is quite possible that they may have done so in other years, such as 1834, 1837, and 1848. Statistics in Egypt are difficult to obtain, because the records for the first half of

this century are mislaid, and it is quite impossible to get information about epidemics at Mecca. It must be remembered that besides the years mentioned in Table I., cholera has been present in Arabia of late years, from 1859–65,* 1871–72, 1877–78, 1881–82–83, and again in 1890–91 In other words, during the last 32 years, cholera has been present in Arabia at least 16 times, and only three times in Egypt. This is the more important because it is only since 1858 that the pilgrims have returned to Suez from Jeddah by steamboat. Immediately after the sacrifices at Mecca, some of the pilgrims at once make for Jeddah and Suez, while others continue their pilgrimage to Medina, and return later to Jeddah and other seaports.

The earliest batch of pilgrims can never reach Egypt till the end of two weeks after the Bairam, and those who have afterwards travelled the extra 245 miles to Medina cannot be certain of reaching Suez till some month or so later. Thus in 1891 pilgrims, if undelayed by quarantine, would have been liable to reach Egypt any day during August and the beginning of September, and now every year, until at least 1897, we shall be exposed to the arrival of about 10,000 returning pilgrims during the hot summer months. Now, a careful study of the various epidemics in Egypt will show that the time to expect an explosion is June, while the potential cholera season for the whole country lasts from the end of May to the beginning or end of October. I therefore think it necessary to call attention to the fact that for the next four years the return of the Hajis will coincide with the season of greatest cholera danger to Egypt.

If the Egyptian Government considers it impolitic to prevent the pilgrimage when cholera is present in the Hedjaz, means should be taken, much more stringently than usual, to prevent paupers from accompanying the caravan to the holy places.

But it is not only the persons and the baggage of the pilgrims which may in some unknown way communicate disease. Those who can afford it bring back for their friends and for home consumption bottles of the precious Zem-zem water, said to date from the story of their ancestors Hagar and Ishmael. This water acts as a purge, tastes and smells horribly, and when analysed in London some years ago was found to be dangerously contaminated by sewage. If it is possible to convey cholera poison in a bottle this holy water will probably do it.†

Danger of crowded Fairs to Egypt.

In 1848 the cholera poison, if not first discovered there, seems at least to have been diffused over the country immediately after one of the Tantah fairs. Again, in 1883, cholera appeared at Damietta just after the large fair there. Until we know something more about the

* Le Choléra, par Dr. Fauvel. Paris, 1868. Page 135. Cholera in East Africa. Dr. Christie. London, 1876.

† Zem-zem water is used by the devout to break their fast during the month of Ramadan, which precedes the Holy Week by three months. In 1883 it began in July.

mysterious causes of cholera, it seems not unscientific to pay attention to the various predisposing aids to an epidemic, and among these must certainly be reckoned any great concourse of Oriental people. It is a little unfortunate that the great Tantah fair takes place always in August; being a very popular one, it is attended for a week by numbers usually exceeding 200,000. The sanitary department for the last few years has done something towards making these festival camps less insanitary, and in 1884 and 1890 the great Tantah fair was prohibited.

Cholera in Northern Syria.

The scourge was officially discovered at Aleppo about September 11th, 1890, having been brought there from the Euphrates by Bedouins. It spread quickly to the principal towns and villages north and south in spite of rigid cordons. Damascus, Beyrout, and Alexandretta, however, escaped, perhaps in consequence of a good water supply. The last fatal case was at Tripoli, a town of 25,000 people, on February 15th. By the official returns Aleppo only lost 654 by cholera, but Dr. Wortabet* believes that there were at least 3,000 fatal cases, more at Hamath, and 2,000 in Homs, which is a town of 25,000. If his information is correct, it will be necessary to multiply the official returns by at least three or four. The duration of the epidemic in individual towns was about 10 weeks, and it seemed to decline after a long storm of rain and cold in the middle of November. Then followed the Tripoli outbreak in December, and after a false lull of security the pestilence again appeared at Aleppo in July 1891.

Nomenclature.

Epidemic cholera is called by a variety of names in Egypt, the most common of which are el hola (the terrible), el heada and el shota, all used exclusively for a malignant epidemic. They are also beginning to use the Greek word cholera, and sometimes make use of el howa el asfar, the yellow air, the origin of which is not certain. The word el hadith is also occasionally used, but that may be employed for any extraordinary mortality among men or beasts.

Land Quarantine.

The Vienna Conference of 1874, with only one dissentient vote, decided on the inefficacy and uselessness of sanitary cordons, but this seems to have been forgotten in Egypt, where they were freely used in 1883. In every case they were put on by the police after people had escaped from the infected town, and were invariably of great harm and of no good. They were continued in some places till the beginning of August, in spite of the fact that cholera had then overrun the whole

* *Lancet*, January 10th and May 9th, 1891.

of Lower and Middle Egypt. At the outset of the epidemic, urgently needed medicines and disinfectants from Cairo were kept outside Damietta for three days by the cordon,* and this was by no means an exceptional case. In June 1884, when we were making preparations for a possible return of the foe, I persuaded the Sanitary Committee, which was then the chief hygienic body of the country, to decide that in the event of future epidemics no attempt should be made at quarantine by land, and it is to be hoped that no future panic will cause this decision to be forgotten.

But it must be remembered that in 1884, Spain and Italy, yielding to terrified advisers, imposed quarantine of five and seven days, both on the frontier and in their own interiors.

The Sanitary Conference at Rome in May 1885 again voted that land quarantine and cordons were useless, Turkey alone disagreeing. Since then, true to her principles, she has surrounded Syrian villages with police cordons both in 1890 and 1891.

Quarantine Board.

This administration has the serious disadvantage of being international, and an analysis of its odd composition will show how difficult it must be for its members receiving various orders from their own Governments to agree on any semi-political question. Besides the English president, there are 22 members, 14 only of whom are medical men. Egypt is allowed seven members, including four English, a Swiss, a German, and an Algerian. France provides a vice-president and another member, but Turkey is represented by a Greek, Spain by a Smyrniote, Portugal by an Italian, Sweden and Denmark by Greeks, Belgium by a Syrian, and Holland by a Maltese. The Blue Books contain one notice of this department in 1883 which is interesting. Dr. Koch reports (No. 22, p. 21) that he saw 500 pilgrims landed at the quarantine station of Tor from one steamer. According to the ship's doctor, all on board were healthy, but during the disembarkation it became evident that several of them were seriously ill, and three fatal cases soon occurred in the quarantine camp.

England, relying upon domestic sanitary progress and the great sums of money expended on public health, can afford to substitute other measures for quarantine by sea, but it is difficult to see how Egypt will be able to imitate her for the present. The guardian of a powder-magazine must take exceptional care to prevent any possibility of the entrance of a spark of fire, and Egypt, with her befouled drinking water and sewage-contaminated air, cannot afford to run any risk of possible exotic invasion. Her own people are apathetic and ignorant enough, but she is exposed to the risk of neighbours even less sanitary than herself, and every year some 10,000 pilgrims return to her accompanied by an amount of filth which must be seen to be believed.

* Blue Book, Commercial No. 38 (1883), p. 28.

So long as she retains the quarantine system, however, she is bound to keep all her stations of detention in the highest degree of preparedness and sanitation.

Atmospheric Influences.

The season of cholera prevalence in Egypt, from the end of May to October, corresponds exactly with the four hot summer months, as is usually the ease outside India. A high temperature favours the spread of cholera, but there is no evidence that the epidemic years 1865 and 1883 were hotter than the average.

Neither could anything seriously abnormal be discovered by searching the records of atmospheric pressure in 1883.

Egypt, with the exception of autumnal showers at Alexandria, is rainless during the cholera months, but after the middle of July the moisture in the air gradually increases in consequence of the Nile inundation.

The pure dry air of the desert seems to prevent cholera from invading the Soudan, and has apparently prevented the transport of the disease by land caravans from Syria and Arabia.* El Arieh, on the desert frontier, was the only place exempt from cholera in 1883. Ozone has perhaps no effect on cholera, but it was pointed out by Dr. Kirker that the mean relative amount of ozone at Alexandria in June 1883 was only 6·4, compared to 7·6, which was the average for the previous eight Junes.† Also the mean wind force for June 1883 was less than for any previous June for 13 years, and the nine days from June 12–20th were phenomenal in showing a continued low wind force which had never occurred in summer and only twice in winter since the meteorological records were first taken in 1876. It seems rational to suppose that stagnant air would be highly useful for the development of cholera. Various writers‡ have referred to oppressive atmosphere and unusual clouds in Egypt during the epidemics of 1831, 1848, 1865, and 1883, and to various colour effects of sun and twilight, all due to moisture in the air without wind force. This condition of things is very common for a few hours in Cairo in the summer, and though very unpleasant is not associated with evident disease.

Subsoil Water.

In Calcutta, as has been shown, the maximum of cholera prevalence is from February to May. This corresponds with the fall of the subsoil water, which goes on sinking steadily till its gradual rise in May. This bears out one of Pettenkofer's laws that the maximum cholera

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* In 1890 the land caravan returning from Mecca to Damascus by short stages lost all cholera *en route*, and arrived in perfect health.

† Blue Book, Commercial No. 38 (1883), p. 67.

‡ Clot Bey, Mr. Chaidufeau, Dr. Willemin, Brigade-Surgeon McDowell, &c.

corresponds with the lowest, and the minimum with the highest level of subsoil water.*

In 1890 the Sanitary Department made some daily experiments with four wells in Cairo, and though the number of wells and number of years is not great enough to be certain of accurate results, it can be roughly seen from Table III. that the subsoil water near the Nile banks is at its lowest a month later than the lowest Nile. In other words, the minimum ground water within some 500 or 600 yards of the Nile is always about the middle of July at Cairo, and this is exactly the time when cholera has usually broken out in that city (June 17th to July 15th). The subsoil water then rises gradually till it reaches its maximum in November, by which time cholera has usually disappeared from Egypt.

TABLE III.

1890.	Distance from Nile bank in mètres.	Lowest Level.	Number of Days after Nile.	Highest Level.	Number of Days after Nile.
Nile at Rodah - -	—	June 15	—	Sept. 28	—
Well in Ezbekieh quarter	500†	July 8	23	Oct. 31	33
Well at Sanitary Offices -	650	July 23	38	Dec. 5	68
Well in Saida Zenab quarter.	1,000	July 28	43	Dec. 10	73
Well in Khalifa quarter -	2,050	Aug. 7	53	Jan. 14	108

Influence of the Nile.

There is a popular belief in Egypt that cholera never breaks out after the Nile has risen. If this means that it does not appear in any given town after the rise there, it is manifestly without foundation, but if it means that cholera does not explode after the Nile flood has reached the Delta, it is true. If we remember that every town in Egypt is supplied with drinking water, either from the Nile direct or from its canal branches, it is quite obvious that the rapid flow in great volume of the annual rise must very greatly affect the health of the inhabitants. It is probably the flood of August and the following months which drives cholera out of the country. An average Nile is at its lowest at Cairo about June 17th, and its rise is then so gradual as to be unimportant till the middle of July. In 1883 the river was very low until the rise began at Cairo on July 1st, and this rise would not reach Damietta in any perceptible form till at least July 10th. It would take another month before it could purify the water supply, and it was then that cholera ceased to ravage the town. Synchronous with the Nile flood is a healthful north wind, which blows up the river and must be of use in dispelling disease.

* Parkes' Hygiene, London, 1887, p. 9.

† Distance from Ismailieh Canal.

Table IV. shows that the Nile reached a very low level before its rise in five cholera years, and this, with its consequent effects on subsoil drainage, must certainly have had a very ill-predisposing effect.

Also it should be noticed that in 1855 as in 1883 the rise was late in coming, and the Delta would therefore have an extra fortnight of very bad drinking water. In 1865, on the other hand, the Nile was neither abnormally low nor late.

The arrival of the Nile flood is of course not sufficient to prevent an outbreak of cholera, for it may be noticed that in Upper Egypt, which gets its rise two weeks or more before Cairo, is affected by cholera some days after Cairo, but the presence of cleaner water in bulk may very likely modify the severity of the disease in the towns above Cairo.

Table IV.

Remarks on the Nile Gauge at Cairo.

Cholera Years.	Date of Rise.	Lowest Level before Rise.		Remarks.
		Cubits.	Digits.	
1831 - -	Not known.			
1834 - - -	Not known.			
1837 - -	- - -	5	8	Extremely low.
1840 - - -	- - -	7	16	Good.
1848 - -	June 13 - -	5	14	Extremely low.
1849 - - -	June 21 -	5	11	Extremely low.
1850 - -	June 18 - -	5	11	Extremely low.
1855 - - -	July 1 - -	7	12	Good.
1865 - -	June 7 - -	7	11	Good.
1866 - - -	June 27 -	7	21	Good.
1883 - -	July 1 - -	6	22	Rather low.

Cattle Plague.

Bovine typhus immediately preceded the cholera of 1883, and may have had something to do with the poisoning of the water supply, owing to the careless habits of the peasantry in thus disposing of carcases, and also may have been one of the causes of the diarrhœa and vomiting which in some places anticipated the epidemic. The fellah, looking on meat food as a rare treat, was only too glad to eat the diseased cattle which had been slaughtered by veterinary order.

I thought it would be interesting to see whether cattle plague had any apparent connexion with previous cholera epidemics, but of this there is no proof.

The cattle plague was introduced into Egypt from Southern Russia in 1841, and raging till 1843, is calculated to have destroyed

665,000 head during the three years.* In 1863 there was another visitation, and it was reckoned that 734,642 cattle died, and were mostly thrown into the Nile,† but none of these were cholera years in Egypt. From what we know of native methods of stamping out disease, we may assume that it was still present in the country in 1865, but no writers on cholera have referred to it. In 1881 the plague was again introduced into Egypt by Russian cattle, and lasted till the serious epidemic of it in the first half of 1883. In April 1884 it was reported from Upper and Lower Egypt, and I found it myself in Cairo. We persuaded the Government to pass some urgent regulations, and prevented the import of all cattle from infected countries such as Russia and Syria. Since then the disease has been unknown in Egypt.

DISCUSSION.

Dr. Stékoulis (Constantinople) said: Je remercie vivement le Dr. Sandwith pour son importante communication. Tout ce que le Dr. Sandwith vient d'exposer est à l'appui des observations faites par tous les médecins pratiquant dans le Levant. Pour nous tous, le choléra n'est pas endémique ni en Egypte, ni dans le Hedjaz. L'étude de seize épidemiques faite pendant une période de 40 ans a prouvé que le choléra est importé à la Mecque par la voie maritime. Le pélerinage de la Mecque est dangereux pour la propagation du choléra non seulement dans le Hedjaz, mais aussi dans l'Egypte et partout dans la Mediterrannée. La quarantaine des pélerins faite en Egypte l'année passée a été salutaire, puisque la maladie a été arretée dans le lazaret de El-Tor, mais ce qui importe surtout, c'est de soumettre les pélerins à leur entrée dans la Mer Rouge à des mesures d'assainissement, d'isolement et de désinfection. C'est sur ce point que nous demandons votre concours.

Si nous avons un bon lazaret dans l'entrée de la Mer Rouge pour appliquer toutes ces mesures à l'égard des pélerins venant de l'extrême orient, nous pouvons être sur, croyez-nous, que le pélerinage de la Mecque ne sera plus un danger de propagation de choléra.

Ce lazaret existe à l' île de Camaran, mais tel qu'il est aujourd'hui ne répond pas ni aux exigences de la Science ni aux droits de l'humanité.

En ce qui concerne l'utilité de la quarantaine, agitée de nouveau par la communication de M. Sandwith, je n'ai qu'à appuyer sa manière de voir, qui est partagée par beaucoup de membres distingués du Congrès. Autant cette mesure de prophylaxie internationale est inutile dans les pays du Nord de l'Europe, autant elle est indispensable dans les pays du Sud. Au Nord, la distance d'un côté et l'organisation sanitaire des pays de l'autre, rend inutiles les quarantaines. Au Sud, l'arrivage direct des provenaux cholériques, l'absence d'organisation sanitaire des différents pays, le climat, et le pélerinage de la Mecque, sont autant de facteurs importantes qui rendent la quarantaine nécessaire.

Nous demandons seulement que cette quarantaine ne soit pas vexatoire, qu'elle frappe surtout les malades ou les gens suspects de choléra et que la désinfection soit faite suivant les progrès de la Science.

* Animal plagues, Fleming, London, 1882, p. 499.

† Typhoid fever was very prevalent in 1863 (Colucci Bey).

Dr. Simpson (Calcutta) said that he was glad Dr. Sandwith had called attention to the fact of the great risk of cholera to which Europe was exposed from the annual gatherings at Mecca. In 1883 Dr. Simpson visited Egypt during the cholera epidemic, and found at Damietta that the conditions under which the epidemic was present were as follows:—A recent and large fair, which had been attended by a number of pilgrims from Mecca, a low Nile, and a basin with slow stream in front of the town, extremely contaminated. When the Nile rose, the infectious matter appeared to be swept away, and the cholera disappeared.

Mecca, Dr. Simpson considered one of the great gates of entry of cholera into Europe viâ Egypt and other countries.

The Disinfection of Scarlet Fever and other Infectious Diseases by Antiseptic Inunction.

BY

J. Brendon Curgenven, M.R.C.S.

For upwards of twenty years, or since Dr. Budd first advocated the inunction of olive oil in cases of scarlet fever to prevent the diffusion of the cuticle, and thereby the spread of the infection, I have constantly as opportunities offered directed my attention to the subject of disinfecting the cuticle by inunction, and thus prevent the dissemination of the poison.

Of the popular disinfectants, I may say that not one is suitable for inunction over the whole surface of the body of a young child; some, because they are too poisonous; others because their solutions in water or oil, or their admixture with fats, vaseline, or lanolin, are injurious by obstructing the natural action of the skin, so necessary during fever, beyond even the requirement of health. Oil and fat also soon become rancid from the heat of the body, and are in this way very obnoxious to the patient.

Carbolic acid is useless for inunction as a bactericide, for the 10 per cent. solution in olive oil has been shown, by MM. Widal and Chantemesse as incapable of destroying the diphtheria bacillus, and the experience of Bucholtz, Garrigues, and Hirst coincides with that of all modern bacteriologists as to the unreliable character of carbolic acid as a disinfectant. The vapour of carbolic acid given off at the ordinary temperature of the air has no effect whatever in destroying infection, nor does it deodorize, nor assist in oxidising gases. The inunction, therefore, of a 5 per cent. carbolised oil as practised by Dr. Brown and others can have absolutely no disinfecting effect; it merely acts as the olive oil of Dr. Budd.

Jeye's Fluid is an emulsion in a solution of a resinous soap, of creolin oil, phenols and pyridines, products of coal tar. No one could advise the application of such an emulsion to the surface of the body. Creolin has been tested by Esmarch, Eisenberg and others, who have

reported that its germicidal properties are inferior to carbolic acid. It is also poisonous; cases have been reported showing its poisonous properties both through vaginal injection, and inhalation.

Bichloride and biniodide of mercury are altogether too poisonous for inunction over the whole surface of the body, and for the same reason it is not safe to place them in the hands of mothers and nurses for any such purpose; yet they have found advocates for their use in both scarlet fever and small-pox, and in spraying the throat and nares in diphtheria.

Thymol, resorcin, and other germicides have been used mixed with vaseline, lanolin, lard, and olive oil. In this form they all possess the objection previously stated, in that the ungent or oil obstructs the action of the skin, besides being exceedingly objectionable to the patient. Another reason for pronouncing against this form of application is that all fats, fixed oils, and alcohol have been proved by many observers to considerably diminish, and in some instances, to destroy altogether, the germicidal power of the drugs mixed or dissolved in them.

My attention for the last few years has been directed to the practical investigation of the power of essential oils as germicides, antiseptics and antiferments, and in their use in the treatment and disinfection of scarlet fever, diphtheria, and other infectious diseases, but more especially in the two diseases named.

I have found that one-half or even one-third per cent. of many of the essential oils, such as cassia, cloves, cinnamon, eucalyptus or cajeput will preserve milk, cream, paste, beef broth or hay infusion from decomposition or fermentation, in fact prevent the development in them of any bacilli, bacteria or other micro-organisms. Air at the ordinary temperature fully charged with the vapour of many of the essential oils, will destroy the bacilli of diphtheria, typhoid, tubercle or anthrax,* and it will preserve beef or hay infusions from the development of any micro-organisms.†

Air takes up or dissolves more of one oil than another, but the saturated solution of one is of nearly equal power as a germicide as the other; in practical use eucalyptus and cajeput are the better because they more quickly evaporate and fill the air to saturation. The ready bactericidal capacity of any essential oil depends on its volatility. They are not all equally adapted for use on the skin, as the dense oils of tardy volatility are as objectionable as a fixed oil, and some irritate the skin, as the oil of cassia, which will blister if used for two or three days.

When several essential oils of unequal volatility are mixed together, air will take up more of the combined vapour than when only one is used, and we get a more powerful disinfectant action. In disinfection by inunction, eucalyptus and other essential oils are more suitable than any other form of disinfectant, in that they rapidly volatilize and fill the air to saturation, their vapour being as powerfully germicidal as the oils themselves.

For the above reason I have in practice used Tucker's Eucalyptus Disinfectant, which consists of two or three essential oils of different

* Omelchenko. † Mayo Robson.

densities, with thymol and camphor dissolved in the oil of eucalyptus globulus. It contains no fixed oil nor alcohol and it evaporates rapidly and completely.

In using inunction in scarlet fever the whole surface on the body is lightly anointed with the oils night and morning for three days, not omitting the skin behind the ears and in other situations that might be overlooked. It is also rubbed into the scalp once a day. After the third day of treatment the skin is anointed only at night, after a warm bath, for seven days, when this treatment ceases and the patient joins the rest of the family.

The bedclothes and the room are sprayed or sprinkled with the disinfectant two or three times a day during the treatment.

The inunction produces a slight stimulating effect on the skin and there is a general sense of warmth, succeeded by composure and sleep. In all mild cases the temperature drops about 3° after the first inunction, and the pulse becomes less frequent.

The oils rapidly evaporate from the warm skin of the patient and fill the air around him to saturation with vapour. Inhaled with every breath this vapour disinfects the mucous surfaces, penetrates to the farthest vesicles of the lungs, is absorbed into the blood and acts directly on the poison throughout the body. Absorption takes place also from the skin, and the oils are there brought into direct contact with the poison, which is believed to be deposited in the intercellular spaces of the cuticle. An emulsion of the oil may be administered, and the throat brushed with the disinfectant, but this is not essential, as in the majority of cases the inhalation of the vapour is sufficient to relieve the local inflammation.

The active stage of development of the poison in these diseases lasts for six or eight days, after which the body casts off from its tissues the germs and products of the disease. If we can succeed, prior to the eighth or tenth day, in destroying all the germs developed, the patient will be incapable of infecting any other person. This is accomplished by the system of disinfection by inunction with the volatile oils, without any isolation whatever. In twenty-six cases treated by myself and my son there was not one case of infection from the patient. They joined the rest of the family after the tenth day, except one or two cases with sequelæ that did not come under treatment until the third day, and in several instances the patients were never separated from the healthy children.

Isolation in the homes of the working classes is impossible, but here the vapour of the oils surrounding the patient destroys all infection proceeding from him and absolutely isolates him in his bed. It penetrates the bed and bed-clothes destroying all infection there, and it pervades the whole room so that no infective germs can escape destruction The disinfection of the bedding and the room is accomplished *pari passu* with the treatment of the patient, and he can, after an ordinary mild attack, return to his school or occupation after the tenth day, instead of undergoing the long period of isolation of six or eight weeks. The cuticle is completely disinfected and it cannot convey any infection to others.

The following are extracts from letters I have received from gentlemen who have used the antiseptic inunction in scarlet fever. They are all strangers to me, as I prefer giving the testimony of those who are not known to me rather than that of my friends.

Mr. Cartwright, of Leintwardine, says :—"I have probably used "more eucalyptus than any man, especially in scarlet fever, and have "been able, after rubbing them with the disinfectant, to place them at "once amongst members of their family that never had it, nor has it "ever in one single instance failed me, and I have had but one case in "the house."

Dr. Elsom, of Whitwell, says :—"I have for some time adopted the "treatment of 'Eucalyptus' and have unbounded confidence therein. I "have had several cases in which one member alone (by careful and "guarded use of the oils) went through a severe course of scarlatina "without another member of the family taking the infection, though "the attendant, with but very slight personal restrictions, looked after "all the members of the household as to their daily wants. I have "perfect confidence in eucalyptus as a means of ridding us of the "undesirable necessity of seeing our patients go to the hospital. The "treatment wants but a careful supervision to make it a certainty of "success."

The Rev. Henry Parker, Rector of Mount St. Mary's College, Chesterfield, writes :—"I am very happy to add the following facts, for "which I can vouch :—

(1.) "Between March 22nd and April 10th of this year we had a "series of scarlatina cases, about 15 in all. Seven of these "were of a malignant type, causing us grave anxiety. On "April 10th, I received six bottles of the eucalyptus fluid— "Messrs. Tucker's Disinfectant Fluid A., and immediately "we used it as spray upon the beds in all our dormitories; "we also had the sick boys well rubbed with the fluid.

(2.) "No new cases occurred for a week, and those who were "already ill improved rapidly.

(3.) "Owing to a blunder of a railway company, we were without a "fresh supply of the fluid for seven days. During that "time four cases were added, but of a mild type.

(4.) "The cases again fell off as soon as we again sprayed the fluid "in the dormitories; but on the seventh day our last occurred. "The boy was 'inuncted,' and in eight days he was quite "convalescent.

(5.) "In *every case* where inunction was employed as soon as the "case was discovered, the sickness was of an exceptionally "mild type. One of the professors, however, who was not "rubbed with the fluid, all but died. His throat was as "bad as either our doctor or myself have ever seen.

(6.) "*Influenza* has been very violent all around us. Several of "our servants have suffered from it; but of those who live "and sleep in the college, about 210 in all, not one has "clearly shown signs of that sickness, although three seem "to have had it partially, and in a modified form.

"I regard this eucalyptus fluid as the most valuable thing I know
"for a public school. Hitherto we have always been in some anxiety
"after the Christmas holidays; now, thanks to the eucalyptus fluid I
"have little fear about the future."

Mr. S. Peake, M.R.C.S., of Shepherd's Bush, writes:—"Having
"read your paper on the treatment of scarlet fever with oil of eucalyp-
"tus in the British Medical Journal of March 29th 1890, I thought you
"would be interested in learning my experience of the same remedy.

"In March last my youngest child, aged four years, was taken ill in
"the usual manner with scarlet fever. Dr. H. Campbell Pope was
"called in and confirmed my diagnosis. The onset was severe, and
"the temperature, when the rash appeared, over 103°, and the child
"was occasionally delirious. Tucker's Eucalyptus Emulsion was given,
"and the child rubbed all over with their disinfectant fluid A., and the
"air of the room kept saturated with the vapour of it by means of a
"spray diffuser. My other two children, aged respectively six and
"eight years, were each given a dose of the emulsion, and then brought
"into the room, and the three children were kept there for eight days,
"taking the emulsion three times a day. At the end of that time, the
"two eldest had not taken the disease (nor have they had it since) so
"were removed.

"My little patient, shortly after the inunction and taking the
"emulsion, fell into a sound sleep of some hours duration, and awoke
"quite refreshed and sensible, and its temperature had come down to
"100°, which it never afterwards exceeded. The rash lasted three days,
"and although it was very vivid when at its height, desquamation was very
"slight, and over at the end of ten days from the beginning of the disease.

"I have treated other cases of scarlet fever with the eucalyptus with
"equally satisfactory results. My opinion of the remedy is, that it cannot
"be too well known."

The only statistics that I can give may be summed up by stating that out of twenty-six cases treated by myself and my son not one case of infection occurred. Many of the children were not separated from others of the family, and in those instances where they were separated, they joined the others again after the tenth day, regardless of the desquamation, and with perfect safety. Not only does the disinfectant prevent effectually the communication of any infection from the patient, but it also destroys the poison when in the stage of incubation, or when exciting the initial symptoms, as the following cases show.

Three young children were exposed to the infection of scarlet fever, whose nurse had the disease, and was not separated from them until the second day. The air of the nursery was kept well saturated with the vapour of the oils for a week; the children were kept in it for three days and nights, after which they were allowed out for their usual walks and escaped the disease.

A girl slept with her sister, who had the fever, and was not separated from her until the third day. She was seized with violent vomiting and headache on the fifth day. The free use of the disinfectant prevented the development of the fever. A young girl showed the premonitory symptoms on the third day, after being separated from her

brother, who was in the third day of the fever. She was kept all night breathing air strongly saturated with the vapour of the disinfectant, and she recovered in twenty-four hours without showing any rash. The boy was sent to the hospital and died there.

This case is instructive. A boy, staying in Devonshire with his cousins who were ill with scarlet fever, was prevented taking it by the personal use of the disinfectant, sent to him by his mother, but his brother in London took the disease, through, it was believed a roll of music, received through the post from the infected house. He had it very severely, was delirious and his temperature rose to 104·4 on the third day. On the 5th day he was so much better that he wanted to get up. He was allowed up on the 8th day, and joined the rest of the family on the 10th. During the whole time of his illness, two other children were constantly in his room playing on and about his bed.

One other case I will mention. The wife of the master of a large parish school, and the mother of several young children, was sent to the Fever Hospital with the disease. She was there four weeks, and would have been kept there for two or three weeks longer. She was anxious to return to her family and to enable her to do this sooner, she was taken by her husband to a lodging. Eucalyptus inunction was used and she returned home at the end of a week, before desquamation had terminated.

No one, with an unbiassed and unprejudiced mind, could hesitate to acknowledge that this method of treatment and disinfection by inunction is a most valuable addition to our power of overcoming infectious diseases.

Let general practitioners keep their patients at home and treat them by this method ; the object of the Government will be attained, as there will be no extension of the disease, and at the same time there will be no need of the six weeks' isolation. In addition to this the ratepayers will be saved the enormous expense of the present system of large isolation hospitals.

DISCUSSION.

Dr. William Emmett (Glasgow) disbelieved in the preventive treatment of scarlet fever by inunction. The treatment had entirely failed in his hands, and in those of his colleagues. He considered it extremely risky to allow children to mix with others, even though inunction was practised; and did not think any practitioner justified in permitting a scarlet fever patient out on the tenth day. In his hands, the ordinary complications were present in many of the cases treated with Eucalyptus. Patients objected both to the taste and smell of the oil, however well disguised.

On the Alleged Connexion of Vaccination with Leprosy.

BY

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Accepting, as I do at present, the bacillary origin of leprosy, and believing that instances have occasionally been reasonably demonstrated of the communication of the disease from one infected person to another who was previously healthy, I have naturally sought for evidence as to every possible means of transmission of the virus. Among other ways by which leprosy might be accidentally inoculated, I have not forgotten vaccination; and I propose now to give a short account of the principal inquiries which bear on the subject, and to discuss the facts which have been alleged to connect the disease with vaccination.

The idea that leprosy could be, or ever was, introduced into the human body with vaccine lymph, does not seem to have arisen in the minds of the 250 or more Indian and Colonial surgeons and other authorities on leprosy, whose replies to the Committee of the Royal College of Physicians were published in 1867 in the celebrated Report of that College. The only mention, indeed, of any possible relation between leprosy and vaccination occurs in the Appendix to the Report, in contributions from Sir Ranald Martin and Sir (then Mr.) Erasmus Wilson; and there is a footnote in the Introduction (p. lxxiv.) referring to their observations, to the following effect:—"The question alluded to "in the communications of Mr. Erasmus Wilson and Sir R. Martin "(*vide* Appendix) as to the transmission of leprous disease by vaccina- "tion and wet-nursing, is one of special interest to Europeans resident "in India and other tropical countries, and calls for a searching "examination."

Sir Ranald Martin's remarks (R. C. P. Report, p. 226,) are as follows:—"In making a choice of native wet-nurses, and of native "children from whom to vaccinate those of English families, still greater "care was used; the hospital dressers being here aided in their inves- "tigations, by experienced native sick-nurses. We soon became aware "that in a large city like Calcutta, a course of procedure such as here "mentioned had become one of expediency at least, if not one of "necessity, if the bare possibility of contagion was to be guarded "against." . . . "The dangers to Europeans arise chiefly from "vaccination and from wet-nursing. I felt that very early in my career "in India, and I took the precautions which are here recorded. I saw

" an English lady last year in a horrible condition, (she said) from " having been vaccinated from a leprous native child."

Sir Erasmus Wilson observes in his "Observations on True " Leprosy or Elephantiasis" (p. 23), that "Several of the cases raise " the question of the possibility of contagion by inoculation or by " lactation"; and that "In one of the cases the disease was developed " after vaccination, but vaccination may have been only the exciting " cause." The cases in connexion with which he mentioned vaccination are:—"Case I. A youth, aged 16, born in Ceylon of European parents, " was brought to England when nine years old, and the disease " developed two years subsequently. He was nursed by his mother, " but vaccinated with lymph taken from a native child." "Case 2. " A youth, aged 18, born in Bombay of European parents, had good " health as a child, and underwent the operation of vaccination with " success. An elder brother died of the disease. The disease com- " menced at the age of seven or eight." "Case 9. Elephantiasis " anæsthetica, following vaccination." A lady, aged 26, born in Calcutta of European parents, and brought to England when two years old, returned to India in 1853. "In 1861, being then in Oude, " she was vaccinated from a native child, and shortly after the vacci- " nation a slight spot came on her cheek, and increased in size to the " diameter of a shilling. Six months later spots appeared on other " parts of the body."

In 1870, Dr. Bakewell, then Vaccinator-General of Trinidad, seemed to incline to the belief that leprosy might be introduced with vaccination, and his report on the subject was brought under the notice of the Colonial Office, and officially submitted to the Royal College of Physicians. After considering the matter, that body remarks, "With " reference to leprosy, it must be observed that there is no evidence " adduced beyond the merest presumption that this disease has now " been transmitted by vaccination, but it seems to be implied in " Dr. Bakewell's report that an infant apparently in perfect health " may be the medium of conveying leprosy, if only its nearest relatives " be lepers." The whole question is ably discussed by Dr. Gavin Milroy in his "Report on Leprosy and Yaws in the West Indies," 1871 (page 32), and he conclusively shows that although in several of the islands some fear of the kind existed in the minds of the public, and that, in consequence, great care was always exercised in the choice of vaccine lymph, the evidence in favour of any such connexion was most scanty and unreliable. Dr. Bakewell's main argument was:—"It " may be taken as proved that the syphilitic poison may be, and has " been, introduced into the system by means of vaccination. And if " that poison, why not leprosy?" He certainly brought forward not a single real fact in support of the theory. Among the interrogatories addressed to the West Indian medical practitioners in 1871, Dr. Milroy included the following:—"Have you any reason, from personal ex- " perience or observation, to believe that leprosy has ever been " communicated by vaccination? Or do you know of any authenticated " instance of such connexion?" The answers received were in nearly

every instance in the direct negative, and many of the observers were men of large vaccination experience, and had specially investigated the question. Only one practitioner, in Jamaica, said that, "This is a "moot point here; I have heard many assertions to that effect from "persons who were endeavouring to account for the presence of leprous "disease in their family"—but he expresses no opinion of his own. Late in the same year, 1871, a circular despatch was addressed from the Colonial Office to the Governors of Jamaica, British Guiana, Trinidad, Barbadoes, Ceylon, Sierra Leone, Cape of Good Hope, and the Straits Settlement, referring to "the alleged propagation of leprosy "by lymph taken from children hereditarily tainted with the disease." Of the Colonial surgeons-general and medical officers consulted on the point, only two confessed to a belief in the possibility of any such transmission, and even these declare that they have no direct evidence in support of such an opinion. The general opinion was that leprosy had never been communicated by vaccination.

The suspicion that there might be sometimes a causal connexion, between the two, seems to have been borne in mind by many subsequent observers, and we even occasionally find doubtful cases in illustration, alluded to in various writings and reports.

Dr. Tilbury Fox, who is cited by the accurate (!) author of certain anti-vaccination pamphlets as one of the believers in the transmission of leprosy by vaccination, has this to say on the subject:—"It has been "said that leprosy may be communicated by vaccination, but if so, it "must be infinitely rare, and scarcely worthy of being taken into "account."

Dr. Castor, who has been for many years in charge of the asylum in British Guiana, gives a very strong opinion in favour of the supposed relation in his report for 1887, and he is one of the very few asylum officers who take that view. The facts which he gives in support of his conclusions, appear to me to be either insufficient or open to argument.*

Cases of leprosy occurring some time after vaccination, but not proved to be due to the operation, are also alluded to by a few other authors.

In the "Report of the Select Committee on the Spread of Leprosy" in the Cape of Good Hope, 1883, Dr. H. Ebden states in evidence: "In vaccinating I think hardly a medical man would take vaccine lymph "from the arm of a leper infant. I know it has been our practice for "the last 20 years not to do so."

In 1880, Dr. Bemiss, of Lahaina, Hawaii, wrote in a paper "On a few Cases of Leprosy" in the "New Orleans Medical and Surgical

* Since this was written, Dr. Castor has explained that his opinion was based solely upon the cases reported by Professor Gairdner (alluded to below), and not upon anything that he had observed in British Guiana. In a letter in the "Journal "of the Leprosy Investigation Committee," dated November 21, 1891, he states in reference to that country that "it is not the fact that there has been any diffusion "of leprosy by vaccination," and both in that letter, and in the evidence which he subsequently gave before the Royal Commission on Vaccination, he strenuously controverts Mr. Tebb's statements and conclusions, and indignantly repudiates the use that gentleman has made of his remarks.

Journal" "vaccination was also inquired into. Alarmed by an invasion "of small-pox in 1853, a general vaccination of the whole population "was ordered, and physicians being at the time very few on the island, "non-professionals aided in the work. It is charged by some that as "a natural result of the labours of the heterogeneous force so appointed, "not only syphilis but also leprosy was greatly increased. In my last "circuit trip in my district I found very few adults who had never "been vaccinated. . . . . This involves the question of inocula-"bility, in my opinion the main, if not the only means of propagation "other than inheritance."

It is indeed the fact that for many years past the belief has been prevalent, even in medical circles in the Hawaiian Islands, that vaccination had something to do with the spread of leprosy in the Islands, and this belief, started by Dr. Hillebrand, has no doubt been strengthened by the observations of Dr. Edward Arning. That gentleman, in his first report (1884) writes as follows:—"A current belief that leprosy "has been extensively propagated by careless and indiscriminate "vaccination induced me to try and vaccinate lepers with a view of "possibly finding the germ in the pustules. Unluckily, although I "tried to procure the best lymph, the vaccination did not take in any "one of the cases." In a subsequent report to the President of the Board of Health, Hawaii, 1885, Dr. Arning observes, "You are un-"doubtedly aware of the very prevalent opinion among medical men that "the unusually rapid spread of the disease may possibly be attributed "to the great amount of indiscriminate vaccination which has been "carried on in the Islands. There have been, if my information be "correct, unquestionably new centres of leprosy developed after vaccina-"tion was practised, and several of the inhabitants have told me how "they themselves used no precautions whatever in vaccinating during a "small-pox scare, but brought the lymph directly from one arm to another, "without even wiping either point or lancet. To bring some light on this "moot point, I vaccinated a number of lepers. The vaccination only "took in three cases, one tubercular and two anæsthetic. Both the "lymph and crust of the tubercular case contained the *bacillus lepræ*; "in the anæsthetic cases I could not detect it. As the vaccinations are "now conducted by medical men and with bovine virus, it may seem to "be perfectly superfluous to dwell any further on this point, it "apparently presenting only historical interest. But recent experience "causes me to advise the Board not only to supply its medical officers "with animal vaccine and points, but also to issue strict regulations as "to the manner how the virus should be used. If the lancet is dipped "into the virus, then into the arm, then again into the virus and the "next arm, or if points used for one vaccination be recoated for further "use, as physicians of the other Islands have at my special enquiry, "owned to doing, then the use of the bovine virus gives us no safeguard "whatever against the propagation of constitutional disease by vaccina-"tion. The main point is the thorough disinfection of the lancet after "making one vaccination, and before dipping it into the lymph of the "next arm. This is easily obtained by heating the point of the lancet

" in a spirit flame to a dull red heat, and it forms a main part of the " instructions issued to the Government Physicians in Germany."

I quote these remarks of Dr. Arning in full, because, like some other remarks on the subject made by competent inquirers, they have been much twisted, and unreasonable deductions have been drawn from them. For the same reason Dr. Mouritz's (of Molokai) report of 1886, may also be quoted from " the third cause to which I attach some " importance, and which has undoubtedly spread the disease, is vaccina- " tion. I can bring forward no case personally, but I have reliable " hearsay evidence that after the operation of vaccination had been " performed on several white children, they manifested signs of leprosy, " and finally developed the disease . . . the possibility of such an " occurrence again taking place, now that bovine virus only is used " in the operation by the medical officers of the Hawaiian Government, " is most improbable. The extent to which each of the following " factors are responsible for spreading leprosy, these factors being " contagion hereditary, and vaccination are as follows :—Contagion 70 " per cent., hereditary 28 per cent., vaccination two per cent. I have " personal knowledge of the two first, which account for almost all " cases. Some few cases not coming under either heading, I have " placed under vaccination as being the most feasible situation for them, " as in the Hawaiian Islands I recognise no other agents at work, such " as we hear of in Norway," etc.

In a paper read before the International Medical Congress last year (translated in the Journal of the Leprosy Investigation Committee No. 2 p. 126), Dr. Arning observes that there can be no doubt as regards the synchronousness of the diffusion of leprosy and the introduction of vaccination in the Hawaiian Isles : but that " it still remains an " open question whether it is possible to arrive at a positive causative " connexion between the two," and he considers that the coincidence may be explained in other ways. Thus, by the multiplication of foci of infection, a sufficiently long time having elapsed from the time of importation of the disease to enable a new generation to spring up from diseased families, and to form fresh centres elsewhere. He also points out that the plague of leprosy and the plague of mosquitoes came together in the Sandwich Islands. These insects, previously unknown in the country, were imported, probably from China, towards the end of 1840 ; and it has occurred to many observers in different parts of the world that such creatures may possibly be one means of transmitting the disease. Dr. Arning, however, speaks of a very remarkable local accumulation of fresh leprosy cases which took place in 1871–2 at Lahaina, about a year after a universal arm-to-arm vaccination had been carelessly performed—50 or 60 cases suddenly occurring, the place having been up to that time comparatively free from the disease.

Dr. Beaven Rake, Superintendent of the Trinidad Leper Asylum, and now a member of the Indian Leprosy Commission, had the matter in his thoughts shortly after proceeding to Trinidad. In his report on the asylum for 1885, he states that, " 17 observations on material taken " from vaccine vesicles or pustules in lepers failed to show bacilli in any

" one of them, a point of interest in reference to the alleged communica-" tion of leprosy by vaccination." And in two subsequent reports he alludes to the question, but without being able to produce any evidence in favour of the possibility of introducing leprosy by vaccination. The report for 1889 contains this paragraph :—" With reference to the " question of the communicability of leprosy by vaccination, Archdeacon " Wright quotes one affirmative reply written by a Trinidad doctor in " answer to a confidential circular (issued by the Surgeon-General). It " should be pointed out in fairness that some 30 or more other Trinidad " doctors to whom the same circular was addressed returned negative " replies." As Dr. Rake observes, many others of the statements in the reverend author's no doubt well-intended, but alarmist and misleading work, "Leprosy an Imperial Danger," must be taken with reserve. With regard to the affirmative evidence of the Trinidad doctor referred to, the statement is as follows :—" I beg to say, for the informa-" tion of his Excellency the Governor, that my experience of leprosy " agrees with the statement of Professor W. J. Gairdner, of Glasgow, " contained in your circular, and that I am of opinion that the disease " in question is communicable by vaccination lymph, from healthy " vesicles only being used." He further states that he has seen two or three cases of leprosy following vaccination, and *because he could not find any family taint*, he considered them due to the vaccination. The patients were of African, Chinese, or Creole families.

With the exception of Dr. Arning's discovery of leprosy bacilli in vaccine from the arm of a leper, perhaps the most important, or at any rate the most talked of, observation, connecting leprosy with vaccination is that of Professor Gairdner just referred to—and his communication to the British Medical Journal in 1887 has been naturally largely quoted and made the most of. The facts were shortly these: —A medical man living in one of the West Indian Islands, where leprosy is endemic, vaccinated his own boy from the arm of a native infant, who subsequently developed the disease. Some time afterwards, the doctor's child became leprous, and another white child, also of British parentage, who was vaccinated with lymph from the arm of the doctor's infant, likewise became a leper. If it could be shown that these children had never been exposed to any other possible means of inoculation or contagion, had never been in contact with lepers, or had to do with food or anything else which might have become contaminated by lepers, then these two cases must probably be regarded as conclusive in showing that vaccine taken from incipient cases of leprosy may communicate the disease. Unfortunately however, we cannot be sure that these children who apparently were born or who lived for some time in a leper land, had not been exposed to the pathogenic conditions of the disease—an objection which has been more than once pointed out by Mr. Jonathan Hutchinson, Dr. Rake, and others.

The " Occidental Medical Times " of September 1890 contained a paper by Dr. Swift, of Molokai, and Professor Montgomery, of San Francisco, on " An interesting case of anæsthetic leprosy apparently " following vaccination." A man, whose sister died of leprosy at

Molokai, and who had always associated with lepers, was vaccinated in 1878, and about a year afterwards he showed symptoms of leprosy. " There is now (1890) a large anæsthetic scar at the site of this vacci- " nation," and the authors ask, " Might it not be that with the vaccine " virus the virus of leprosy had also been inoculated?' As I have remarked elsewhere, this is a fair example of the bulk of the evidence as yet brought forward connecting leprosy with vaccination. Here is a patient living all his life in a leprous country, admittedly associating with lepers, and subject to all the conditions, dietetic, contagion, and what-not, which may have had casual connexion with the disease; but because he happens to have developed leprosy a year after he was vaccinated, and now (12 years subsequently) shows an anæsthetic patch at the scar, he is adduced, *post hoc ergo propter hoc*, as an instance of the probable inoculation of leprosy by vaccination.

To my mind, two far more likely cases from the Cape of Good Hope are recorded by Dr. Daubler, in the Monatshefte für Praktische Dermatologie, 1889, and alluded to by Surgeon Brunt, R.N., in a Report to the Naval Medical Department, 1888:—Elizabeth H., aged 32, of English parentage, affected with tubercular leprosy for 5½ years. " When small-pox " was prevalent, she was vaccinated. There was no vesicle, no pustule. " In four days the puncture was merely slightly black. A small " 'lump' formed on the spot some months after, and subsequently " other 'lumps' formed, especially on the inner side of the left arm. " In a short time her brows became red and hot, and the face, especially " the nose, was full of lumps." The second case was that of Rachel T., aged 16, who was vaccinated five years before she was seen. A " lump " is said to have appeared on her left arm afterwards, and in about a year others on the face, etc. It would be satisfactory if the details of these cases were more closely inquired into, and if their histories, no doubt furnished by the patients themselves, could be vouched for by competent observers.

Very few British leprous patients who have developed the disease abroad, or in whom the symptoms have become manifest after their return home, put down their malady to vaccination. The large majority of them, indeed, have never been vaccinated abroad, the only exception that I personally know of being the lady whom I submitted to the " Koch treatment " in the early part of this year, who stated that she was vaccinated in India four years before the symptoms appeared, and seemed to think that it might have had something to do with her disease.

Dr. Piffard, of New York, stated in 1881 his belief that vaccination might transmit leprosy. In his work on Diseases of the Skin he gives the following case:—W. T., aged 25, of English parentage, but was born and passed his early life in British Guiana. After a vaccination performed when young, his arm became greatly swollen and inflamed, and large sloughs separated. Investigation revealed the fact that the vaccine virus had been taken from a negro whose mother was a leper. At the age of seven years some brownish spots appeared upon his back and arms, and at the age of 11 a blister formed on the palm

of the right hand, followed by permanent contraction of the flexor tendons. The case developed into a well-marked one of anæsthetic leprosy. In this instance, too, corroboration of the facts stated would be desirable.

In his important work, "Leprosy in British Guiana," Mr. J. D. Hillis gives an account of some cases "in which there could be no "reasonable doubt but that the disease was produced by vaccination "with tainted lymph." He considers the following conclusive on the point:—J. F. C., Portuguese, born in Demerara, aged 20, suffering 10 years from tuberculated leprosy. A sister, aged 18, also a leper. They were both vaccinated with lymph obtained from a member of a Portuguese family in whom leprosy was afterwards found to exist. They were the only members of the C. family vaccinated with this lymph. Within 18 months of the performance of the operation, a reddish brown spot appeared on the inner side of the right thigh, preceded, it is stated, by some constitutional disturbance. Other spots and tubercles subsequently appeared. They were the only members of the family affected.

These cases are no doubt very suspicious, to say the least, but they are open to the same objections as Professor Gairdner's and the others quoted.

In Professor Leloir's excellent and comprehensive "Traité de la Lepre," 1886, occurs the following passage:—"D'ailleurs est on sur "que la lèpre n'ait jamais été inoculée par la vaccination. Bien que "cette question n'est pas encore jugée, je rappellerai que le docteur. Onetti on a publié un cas dans la Gazetta Medica de Milano, 1846." He makes no further allusion to the question.

The above references show that the question has been under consideration for many years past, and it is important to note that, comparatively, so few possible instances have been found.

With the exception, indeed, of one or two scattered expressions of opinion from medical authorities admitting the possibility of leprosy inoculation by vaccination, I have been able to find no further real evidence or reliable statements of facts upon which valid conclusions could be based. Of course such narrations as the following are to be seen now and then in general newspapers, clerical journals, &c., and these, no doubt, are well calculated to impress the ignorant. "A sad "case occurred here a short time ago which shows the danger that "arises from the practice of vaccination in an island where leprosy is "treated as of no account. A few months ago, a little girl, the daughter "of a Wesleyan missionary, who came to the West Indies from "England two or three years before, fell ill. On being examined by "the doctors it was found that the poor child had contracted leprosy. "*The only probable means of communication was by inoculation,** "and thus the parents endeavouring to save their daughter from the "very remote danger of small-pox, inoculated her with the horrible

* The *italics* are mine.

" poison that will make her life a living death and herself a loathsome " and repulsive spectacle"—and so on, in the same strain.

Quite recently Dr. Hansen, of Bergen, in answer to certain inquiries of mine, has written that vaccination which has been compulsory in Norway for many years, has been largely practised in the leprous districts from arm-to-arm, and that hitherto no case of transferring leprosy thereby has been known. He is further investigating the matter at the present time. I need hardly allude to the fact that leprosy has been steadily decreasing in Norway, Sweden, Iceland, and other places where vaccination has been compulsory for many years. Attention has been well directed to this point by Mr. Hutchinson.

It occurred to me that it would be interesting to know what effect in this respect vaccination has had in China, which is one of the great centres of leprosy, and where vaccination is by no means universal. Dr. Patrick Manson, whose large experience in that country is well known, has thus written to me :—" As regards leprosy and vaccination " in China, I am sure that there are no data obtainable on which to " found a reliable opinion on any supposed connexion. Of the many " lepers I have examined, not one of them has attributed his leprosy " to vaccination. Leprosy is common in the district where vaccination " has been practised for the last 60 or 70 years; but, on the other " hand, it is more common in districts where vaccination has only been " recently introduced; and is practised to a very limited extent only. " It is impossible to say if it has had any influence one way or another " in the spread of leprosy."

When I heard that this question was to be brought before the Royal Commission on Vaccination, I must say that I looked forward to obtaining some fresh facts and definite information—especially as Mr. Wm. Tebb, who was to give evidence on this subject, had visited many of the leprous countries of the world, particularly, I believe, to collect facts to prove the alleged connexion—but I have been woefully disappointed. In his evidence a great deal is, of course, made of the observations of Dr. Arning, Professor Gairdner, Mr. Hillis, Dr. Castor,* and of some of the others quoted above, as well as of the opinions of certain gentlemen, who, Mr. Tebb appears to consider, are very high authorities, and among the " most distinguished names in the profession." One of these gentlemen holds the view that syphilitic vaccine lymph may ultimately lead to the spread of leprosy; and another has written a pamphlet on the subject, which seems to me to be as full of loose statements, inaccuracies, and false deductions as Mr. Tebb's own evidence.

In point of fact, although we may admit *à priori* the possibility of an occasional accidental inoculation of the disease by vaccination, we have up to the present time no absolutely clear and incontrovertible evidence causally connecting vaccination with leprosy; and, in my opinion, anyone who says that vaccination is to any extent responsible for the spread of leprosy, talks arrant nonsense.

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* *Vide* note on page 386, *ante*.

From what we now know concerning the introduction of bacillary diseases in man and animals, it certainly, however, behoves medical men to be extremely careful in the selection of their lymph for vaccination; and in a country where leprosy is rife, it seems to me that it will be advisable to exercise particular caution, and, if possible, avoid, as is now being done in Hawaiia, an indiscriminate arm-to-arm vaccination among the natives.

I am glad to say that the question of the possibility of transmitting leprosy bacilli by vaccine is receiving attention on the part of the Indian Leprosy Commission, and that a paper on the subject by Drs. Beaven Rake, and Buckmaster will appear in the next number of the Leprosy Journal.*

On the Importance of more actively enforcing the Ventilation of Public and other Buildings, suggesting a Standard of Impurity of Air as a Basis of Prosecutions.

BY

J. P. Williams-Freeman, M.D., Andover.

In one way I consider myself very fortunate in being one of the last members of the Congress to read a paper in this Section, namely, that I have been able to hear and read a good deal of the work that has been done in this and other Sections, and it has all tended to confirm me in my belief that an improvement in the quality of the air supplied to public and other buildings, but especially to factories and workshops, is one of the most important, perhaps *the* most important, sanitary reform that we can hope to bring about.

Ventilation is such an elementary common-place subject, and holds such an important general place in preventive medicine, that it seems almost unnecessary, not to say invidious, to select any particular disease as an illustration of its importance. Well in the front rank, however, of diseases fostered by impure air, stand phthisis and diseases of the respiratory system, taken either separately or together.

The causation of phthisis we have heard discussed in this Section; that of tuberculosis in the Section of Bacteriology. What, from a practical point of view, does all we have heard amount to? This: that on the one hand the virus, the bacillus, is communicable to us chiefly by ingestion with food, and by inspiration with air, where it is very

* "Journal of the Leprosy Investigation Committee," No. 4, Dec. 1891, p. 32. The authors vaccinated 87 cases of leprosy at Almora, and 40 of these developed vesicles, 31 being normal; "in no case were leprosy bacilli undoubtedly found." The whole question is discussed, and the authors conclude that "it is evident that "the risk of transmission of leprosy by vaccination is so small, that for all practical "purposes it may be disregarded."

frequently present; and, on the other hand, that our bodies in general, and our lungs in particular, are easily capable of being so reduced in vitality as to become a suitable nidus for the tubercle bacillus.

Opinions differ as to the relative proportion of cases due to absorption of the virus in food and in air respectively, but this is certain, that though we ought to take every precaution to kill he bacillus in milk and beef—that is on its way from the bodies of the cattle to those of ourselves—still the really radical way of dealing with it is to prevent its victimising the cattle, and this is ultimately entirely a matter of ventilation; for no one will deny that tubercle is found in cattle just in proportion as they are deprived by man of the natural conditions of a free supply of fresh air.

To my mind a beautiful confirmation of the truth of the bacillar theory of tuberculosis is found in a study of the distribution of phthisis. The statistician is to the bacteriologist in preventive medicine what the clinician is to the pathologist in curative medicine, and it augurs well for the success of treatment when they are found in thorough agreement. The bacteriologist tells us that warmth, moisture, and a limited supply of oxygen are favourable to the growth of the bacillus; the hygienist and demographist come forward with three classes of observed facts.

First, the old observations of Bowditch and Buchanan, as to the influence of a damp subsoil.

Secondly, the fact that the death-rate from phthisis shows a regular increase, inversely to the airiness of the districts. First come the windswept islands of the Western Hebrides, where we are told phthisis is almost unknown, then the coast districts of our own and other countries, then the agricultural districts, then the small towns, and, lastly, the central districts of the large towns.

The day before yesterday Dr. Finkelnburg, of Bonn, pointed out to us in this Section a large area of North-eastern Germany, where the death-rate from phthisis is lowest, and he did not omit to say that it was swept by the winds of the North Sea; while Dr. Gibert, of Havre, followed him by pointing out that phthisis was most prevalent in the old districts of his town, where the streets were narrow and the houses six and seven storeys high.

The third class of facts is found in the distribution of the disease in the different occupations of man. Dr. Ogle has reprinted his table in a paper read at this Congress in the Demographical Division.* I would refer members to his paper where they will find the table. They will see that fishermen stand at the top of the list as the class least affected with chest diseases—their figure being taken at 100—while tailors and printers are at the bottom with the figures 238 and 317 respectively.

So much for phthisis; but that is not the only disease produced by bad ventilation—the headaches, malaise, sore throats, and loss of tone, which result from it, besides rendering our bodies a suitable nidus for

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* *See* Volume X., page 12.

tuberculosis, constitute diseases in themselves, and besides all these there is the spread of zymotic diseases due to insufficient ventilation.

I do not think, therefore, that we can say it is want of knowledge of the evil that stands in the way of reform so much as want of action, and I confess that I think medical men in general, apart from professed sanitarians, are much to blame for their want of insistence in the matter. The evil of badly ventilated buildings is so familiar to us—we have been lectured from our youth up in ill-ventilated class-rooms, we have stewed in fœtid out-patient departments, we have acquired headaches in gassy theatres, and we have slumbered in stuffy churches, all so often and so naturally, that we forget the real magnitude of the evil, and that we are acquiescing with only an occasional and useless grumble in a state of things which, if it only cause one-half the phthisis and other respiratory diseases, is responsible for as many deaths as all the zymotic diseases put together.

English sanitary legislation recognises the evil of improper ventilation in more than one Act. The Public Health Act recognises as a nuisance" "any factory, workshop, or workplace not ventilated in "such a manner as to render harmless, as far as practicable, any "vapours, gases, dust, or other impurities generated in the course "of the work carried on therein, that are a nuisance or injurious to "health, or so overcrowded while work is being carried on as to be "dangerous or injurious to the health of those employed therein."

We Englishmen have been often told in the last week that we are a practical nation; I think our "practicalness" is shown in this clause, for it will bear any interpretation that public opinion can be induced to put upon it.

Practically, no one will pretend that proper ventilation is at present really enforced either in public buildings, factories, or work places. Beyond byelaws, founded on considerations of cubic space, to prevent overcrowding of common lodging-houses, little is done by most sanitary authorities, and everyone will agree that public buildings, shops, domestic workshops, and offices are often—indeed, as a rule—so badly ventilated, as, in the long run, to be dangerous and injurious to health.

I believe this state of things will continue until a standard of ventilation is agreed upon, and until every owner of such a building, be he the owner of a large factory, a shop, or a sweater's den, lives in daily fear of an inspector "sampling" his air; and it is in the desire of doing something to ripen public opinion in this matter, and strengthen the hands of the sanitary administrators, that I venture to hope this Section will in some way give its authority to the proposition that the air in a building must necessarily be dangerous and injurious to health if it exceeds a certain standard of impurity. Let us urge upon those who have the privilege of enforcing legislation, to take that impurity as constituting, in itself, the basis of prosecution. Questions of cubic space, and the means of ventilation are precautionary measures for the owner and his architect to attend to—the impurity and, perhaps, the temperature, should be the only question for the medical officer.

I would suggest as a standard of impurity of air a per-centage of carbonic acid gas more than double that in the air outside the building at the same time. This would, in most localities, roughly correspond to what, according to de Chaumont, would be recognised by the senses as "rather close; organic matter becoming perceptible."

In asking sanitary authorities to thus take a standard of impurity of air as a basis of prosecution for insufficient ventilation, we are doing nothing more than urging that impure air is as easily recognised and as certainly harmful as impure water or unsound food. Impurity on examination is universally taken as the basis of proceedings in the case of food and water, why should it not be so in the case of air?

What would be thought of an owner of a polluted well if he defended himself by saying that it contained many hundred gallons of water per head of consumers? Yet this is exactly analogous to accepting the cubic space of a room as sufficient evidence of its being properly ventilated.

The objections to actively dealing with ill-ventilated buildings on such a basis (and I should like to see all factories, "domestic workshops," places where work-people are employed, places of public entertainment or worship—that is practically all buildings that are not private dwelling-houses—so dealt with), range themselves, I take it, under three heads:—

First, that the evil is not so great as to justify such an interference on behalf of the law. I have already insisted on the magnitude of the evil, and believe it is fully acknowledged by every thinking man.

Second, that analysis of air does not give sufficiently accurate and trustworthy information to base proceedings on. It may be urged that we do not even know what are the nitrogenous bodies that are present in our exhalations; that morbific germs may be present in comparatively pure air, or absent from air with a high per-centage of carbonic acid. Objections of a like character may be made to water analysis. It is only by availing ourselves of every kind of information about a water—its source, proximity to possible means of pollution, &c., &c., that we condemn a water on analysis, and I would have the same consideration taken as regards air. Practically, it is universally recognised that the carbonic acid in air may be safely taken as a measure of its impurity, whether it be derived from combustion or respiration, each of these sources of carbonic acid supplying with it other injurious impurities. And the carbonic acid can be estimated quantitatively in air with absolute accuracy and great ease, and also, if required, the nitrogenous matter in terms of albumenoid ammonia.

Third, it may be urged that the art of ventilation is so much behind the requirements of the times that it is impossible to ventilate all buildings with success and that it would be futile to attempt to enforce it. Against this I would point out that the standard I have suggested is, I think, a very moderate one; that there is no insuperable difficulty in the way of any amount of circulation, or heating, or cooling of air in a building, and that it is simply a matter of expense; that the

practical possibility of good ventilation is shown by the fact that some buildings, such as one or two of our underground theatres, are perfectly well-ventilated; that the introduction of the electric light is rendering less ventilation necessary; and last, and most practical of all, that if sanitarians insist upon proper ventilation, engineers will soon find a means of supplying the demand, the ventilation of a building will become as much part of the architect's routine duty as water supply and drainage, and will, I firmly believe, be as much a saving of life and health as either.

This paper contains nothing new, nothing scientifically valuable, nothing even interesting; my excuse for bringing it forward must simply be that I believe if we could in any way obtain an improvement in this simple, every-day matter of ventilation, an enormous amount of suffering and disease would be saved to humanity; and that especially from the ever present scourge of phthisis we should rescue many more victims than if we could announce at this Congress the discovery of the much sought-for cure.

Dr. Dickson, R.N., proposed, and Dr. Seaton seconded a vote of thanks to the President for his distinguished services in connexion with the work of the Section. This was carried by acclamation; and the proceedings of the Section then terminated.

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